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A Record of the Progress of Pharmacy and the Allied Sciences

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THE AMERICAN
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VOL. 98 JUNE, 1926 No. 6

EDITORIAL

COMMENCEMENT

ALL OVER the land, the academic flood gates have just been opened wide, and youth pours out to irrigate the world with wisdom. Ground fine in the mills of the pedagogue, steeped in the tenuous learning of books and percolated through and through with the solvent flow of classroom technique, this saturated essence, alive in active principles, now flows out to serve its several purposes.

Arid wastes await it—hidden seedlings in the sand crave its blessed touch and parched green things perk up to offer welcome to its gay caresses.

* * *

Yet before the world can safely entertain this fluid force, it must suffer great attenuation. And suffer it will before it serves. The learning of books must be unlearned, and the rain of experience must drizzle long before youth's corrosive ions will yield to useful dilution.

Said the cynical old doctor—"For five years after my graduation I still believed in all I had read in books and in all that my instructors had taught me. For the next ten years I discounted my teachers' learning, but still had faith in books—but *now* I have lost that faith as well—and *now* I have commenced to serve my people."

* * *

To the young graduate in Pharmacy, who now turns his back on busy study days and happy-go-lucky school days, and commences his life work with eagerness and lively hopes we commend the reading of "Whither," an article that is printed elsewhere in this issue.

We do not commend its perfunctory reading, for entertainment —but the careful, assimilative reading of it, so that its points may get their chance to penetrate.

The title is interrogatory, but the article itself is the answer complete.

Pharmacy were far more honorable and honored if all its practitioners were active in doing the worthwhile things stressed in this worthwhile address.

I. G.

THE BUSY BEE

THE life of the social insect has been attracting much attention of late years. It is a field in which considerable "nature faking" may be and is offered. Imagination has been allowed too much play, but the facts are interesting and instructive. Maeterlinck and Fabre must be read with caution, but wholly trustworthy information is to be found in standard works. Lately, a comprehensive investigation of hive life has been made by von Frisch, whose results were presented in a lecture last January before the Senckenberg Natural History Association (Frankfurt a M.) and published in the official bulletin of the society (*Aus Natur und Museum,* 1926, *56,* 65). The lecturer began by alluding to papers published by a Munich naturalist, v. Hess, in 1912-3, in which it was asserted that many invertebrates and some vertebrates are color blind. Hess based his view largely upon the fact that these animals were attracted to the parts of the spectrum which were reported by totally color-blind persons as appearing the brightest. The report of v. Frisch's lecture is by Dr. W. E. Ankel. From a passing allusion in the abstract it seems that the lecture was illustrated by a motion-picture film of procedures in the hive. To determine the question as to the power of the worker-bee to distinguish colors, sixteen squares were arranged in checker-board fashion of which one was blue, and all others, gradations of grey. Each square bore a watch-glass, but only in that on the blue was a small amount of sirup placed. Bees sought the sirup in large numbers, though a few ignored it. After a few hours or several days the arrangement of squares was changed and no sirup was put in any of the glasses. Bees at once lighted on the blue square and sought zealously for the sugar. It seems proved that the insect has a differentiating color sense, as the conditions of the experiment eliminate other features that might attract, such as odor and sense of location. Other methods of eliminating the possible influence of odor were by

covering the squares with a glass plate and also by sealing them in glass tubes. Accidentally these bees showed their appreciation of blue as a location for nectar by swarming around a spectator of the experiment, who was wearing a blue coat and who got rid of the swarm only when he took this off. The attraction of other colors was tested and it was found that orange-red, yellow, green, violet and purple-red were similar to blue but scarlet-red seems to be confused with black. Other insects seem to confuse scarlet-red with black, and v. Frisch states that flowers that depend on insects for fertilization are rarely of this color, at least in Germany. Red flowers have as a rule a blue admixture. It is stated that another German naturalist has shown that bees have a very acute perception of some ultraviolet rays. It has been shown lately by an American naturalist (Lutz, *Ann.* N. Y. Acad. Sci., 1924, *29*, 181) that a considerable amount of ultraviolet is reflected by many flowers and this taken into consideration with Wood's demonstration of the notable amount of infra-red reflected by leaves, suggest questions of color contrast that are quite perplexing, since human eyes are blind to both these classes of rays and we are unable to formulate the nature of the contrast. While the range of color sensibility may be more extensive in bees than in human beings, a quality distinction may be less, as v. Frisch states that orange-red, yellow and grass-green seemed to appear about the same to the insect. It also seems that bees notice the color of the hive to which they belong, for if the color is changed they are apt to go astray. Experiment also shows that odors may be distinguished and remembered. Bees that had been led to a source of sirup flavored with star-anise oil soon acquired the ability to reach this amid numerous odorless containers.

The most remarkable results of v. Frisch's investigations concern the method by which the bee coming home with a store of nectar or pollen communicates with others. A hive was constructed so that observation could be easily made and a large number of bees were marked by colors so that a complete identification of them could be made even among thousands of fellows. A bee so identified is observed in the hive, shortly after entering. It begins a movement which v. Frisch terms a "round-dance," running quickly with mincing steps in a circuit, at short intervals reversing the direction. The bees nearby become excited, arrange themselves with their heads towards the dancer, and touch the body with antennæ. Soon workers leave the hive and later appear at the source of the nectar or pollen.

To determine whether the incoming bee had communicated the direction of the nectar source, a glass with sirup was placed near the hive and a large number, similarly charged, in all directions at different distances, going as far as a kilometer (about two-thirds of a mile). It was found that the bees scoured the whole area and appeared at all the localities, even the most distant. The incoming bees, however, may frequently give suggestions of locations of source of honey or pollen by the odor of the flowers. A somewhat different form of dance was noted on the part of those bees that bring in pollen instead of honey, in which case also the indication is general and does not cover direction, which is probably secured often by the odor of the material. Interesting experiments were made by substituting stamens of one flower for those of another. The stamens of *Campanula media* were substituted for those of *Rosa moschata* and *vice versa*. The experiments showed again that the manner of the dance is not the definite indication of the source of nectar or pollen respectively, but the odor is the actual guide.

HENRY LEFFMANN.

SELECTED EDITORIAL

WHISKY—THEN AND NOW*

SOON after the passage of the Federal Food and Drugs Act of 1906, the formulation of definitions for various products likely to come under the suspicion of the enforcement agents became a pressing and highly debated problem. It early included the question of what constitutes whisky. After considerable controversy the simple official conclusion was reached, in effect, as Bailey [1] has expressed it, that the commodity which was then, and which had been for many years, commonly known and accepted in the trade and among consumers as whisky, was whisky. This interpretation did not limit the name to that product aged in wood whereby the aroma and flavor for which whisky is prized are acquired; nor did it make the natural color developed by the aging process an essential. Thus, factitious whiskies made largely, or in part from mixtures of grain alcohol, caramel, beading oil and

*Reprinted from *J. A. M. A.*, *86*: 1771 (June 5) 1926.

[1] Bailey, E. M.: The Thirtieth Report on Food Products and the Eighteenth Report on Drug Products, 1925, Bull. 276, Connecticut Agric. Expt. Station, March, 1926.

artificial flavor were widely sold as, and for, whisky long before prohibition became operative. The same government chemist has pointed out that, presumably under the influence of the Volstead Act, whisky and brandy, which had hitherto been recognized as medicinal agents and included in the United States Pharmacopeia, were omitted in the ninth revision of that text. But, in view of the fact that both of these commodities are legitimately obtainable under proper restrictions, it would be unfortunate if there were no official specifications for their substance and quality, and in the present (tenth) revision of the Pharmacopeia these two products are again recognized.

Through circumstances that do not require discussion here, it happens that alcoholic fluids alleged to be whisky have not been entirely excluded from use as beverages. The fact that most of both the manufacture and the traffic in such products is conducted in illicit ways has led to widespread possibilities of "adulteration" that may have unexpected menaces to the health of those willing to indulge in the bootlegger's wares. The real danger in the substitution of methylated spirit, or wood alcohol, for ethyl alcohol in potable fluids is now generally recognized.[2] Not long ago we referred to the unexpected presence of considerable—perhaps even menacing—quantities of copper found in samples of "hooch" by government authorities in Massachusetts.[3] An informative investigation of samples of alleged whisky secured by police or prohibition officials in connection with the enforcement of state or federal laws has been reported from Connecticut.[1] Aside from a series of samples in which wood alcohol had been substituted for grain alcohol and all of which were traced to one source, no foreign substance was identified in "bootleg" liquor of the types ordinarily used as beverages, which in kind or amount could be regarded as a probable cause of death.

There is substantial analytic and other evidence to show that much of the alcohol used in preparation of present-day liquors is obtained by the rectification of denatured alcohol, particularly the specially denatured type. Such alcohol generally shows on analysis traces of denaturants that have carried over in the process of purification. What the physiologic effects, cumulative or otherwise, of these small amounts of denaturants may be is speculative, but the Connecti-

[2] Medical Aspects of "Bootleg" Liquors, editorial, *J. A. M. A., 84:* 1182 (April 18) 1925; Alcohol—Pure and Impure, *Ibid., 85:* 1560 (Nov. 14) 1925.

[3] "Hooch," "Home Brew" and Copper, editorial, *J. A. M. A., 86:* 1552 (May 15) 1926.

cut chemists are aware of no authoritative opinion that traces of such substances as diethylphthalate, isopropyl alcohol, benzene and acetone are likely to produce measurable effects of a dangerous character. However, they insist that with the evidence that much of the alcohol found in intoxicating liquors is derived from the denatured article, there is always the possibility of inefficient purification, and hence such liquors constitute a potential source of danger. In nearly half of the samples tested the alcohol appears to have been derived wholly, or in part, from denatured alcohol.

It is not without significance to compare the bar whisky of the cheaper sorts dispensed a decade or more ago with the stock in trade of the bootlegger. The average alcohol content is essentially the same. Artificially colored whisky was about as prevalent before prohibition as it is now. Perhaps some of these findings will help to interpret an experienced chemist's comment that "the most poisonous constituent of alcoholic liquors is the alcohol which they contain." Nevertheless it is well to bear in mind further the conclusion of Bailey that the possibility of clumsy manipulation of denatured alcohol in order to make it fit for beverage purposes constitutes a menace to health which cannot be ignored. This applies not only to whisky but to similar liquors, such as gin, brandy and cordials, of high alcoholic content, all of which may be produced factitiously.

VOLATILITY OF BORIC ACID IN AQUEOUS VAPOUR.—The statement met with in the literature that $B(OH)_3$ is volatile in aqueous vapour is incorrect. At the ordinary temperature it is not quite volatile. Metaboric acid, on the other hand, is volatile. If, therefore, the temperature is raised by superheating the steam so that ordinary boric acid is dissociated into metaboric acid, $B(OH)_3 = BO.OH + H_2O$, then the latter will be found in the distillate. In the Tuscan suffioni, the aqueous vapour has a temperature of 120-130° C. at the point of issue, and the boric acid is in the meta form. This combines with water to form $B(OH)_3$ when the temperature of the condensed vapour falls, and it is then no longer volatile in aqueous vapour.—R. Anchuetz and K. Riepenkroeger (*Berichte,* 1925, *58,* 1734; through *J. Pharm. Belge,* 1926, *8,* 85; through *Chem.* and *Dr.*).

CHANGES IN ALKALOIDS ON STANDING.—The authors state that of all the aqueous solutions of various alkaloids tested, quinine was the only one that seemed to be unmodified by the end of six months, responding the same as before to both chemical and biological tests.—E. Mura and E. Petiti (*Clin. Med. Ital.,* Milan, *56,* 298, through *Chem.* and *Dr.*).

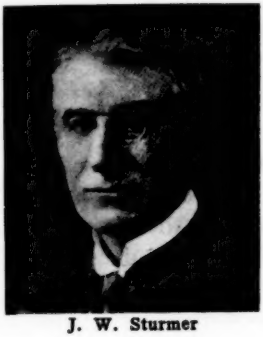
ORIGINAL ARTICLES

MORE ABOUT COLOR AND COLORS†

By J. W. Sturmer

Dean of Science, Philadelphia College of Pharmacy and Science

VISITORS from a foreign land, on viewing our show-window displays, and the raiments of the stream of shoppers—particularly those of the soprano sex—must needs conclude that we are a color-loving people. Nor can it be said that our interest in color is wholly emotional, for in this truly scientific age matters which formerly were of moment only to scientists have come to be common knowledge, and the "man on the street" now talks freely about wave-lengths, ultra-violet light, and the like. He knows the secret of the rainbow. He knows about refraction and reflection. He is not awed by a little science, or disconcerted by scientific nomenclature.



J. W. Sturmer

It is not the purpose of this lecture, however, to lead the reader into the domain of abstruse physics, but rather to present as simply as possible, and mainly in non-technical language, some interesting facts about color in nature.

Pigment Colors and Structural Colors

As was explained in the lecture on colors previously given, and to which this is a sequel,* the color of an object may be due to the chemical nature of the substance composing it; that is, it may be due to the presence of chromophore groups in the molecule, and within these groups to a particular functioning of the electrons of specific atoms, by virtue of which functioning the substance may be able to "tune in" certain wave-lengths of sun light, with a reflection of a blend of the unabsorbed waves. When color is produced in this manner, we have what is commonly termed a pigment-effect. Thus, a dandelion is yellow because it contains a yellow pigment, namely a

†One of a Series of Popular Lectures given at the Philadelphia College of Pharmacy and Science, 1925-1926 Season.

*See *Popular Science Talks*, Vol. III.

substance capable of selective absorption, because of its chemical character, with reflection of the unabsorbed light-waves, which happen to be yellow.

But not all color phenomena in nature are pigment-effects. In some cases color is due not to the chemical make-up, but to the physical structure, giving rise to effects which we speak of as *structural colors*. The blue of the sky, the iridescence of pearls, the rainbow colors of certain insect wings, are structural effects. Not only are there many color phenomena in nature due to physical structure, but the appearance of a colorless object may be greatly influenced by its structure, and pigment-effects, generally, are frequently modified in this manner, as we shall see.

Let us consider, first of all, the reflection of white light. Some objects, as we know, are transparent, while others are opaque. And when an object is opaque, it may reflect scattered light, as in case of this paper, or the light may be reflected without appreciable scattering, as from a polished or burnished surface of silver, giving a so-called mirror effect. Now whether reflection occurs the one way or the other, is wholly a matter of structure, particularly of the surface, and is not at all connected with the chemical character of the substance. Thus, for example, silver, deposited by electrolysis, as in silver plating, scatters the reflected light because of the minute hills and valleys which make up its uneven surface, while burnishing, which levels the surface, causes the mirror-effect to appear. We can also deposit silver from a solution so as to obtain particles which look black because they absorb all the light waves—or we may contrive to obtain particles so small as to exhibit selective absorption, and therefore show color, as in case of a colloidal solution of silver. Yet, as far as we know, the silver, in these instances, is chemically the same. The difference in appearance seems to be due to difference in physical structure.

Scattered White Light

Now silver is inherently opaque, as are metals generally. But why is a snow ball, which is made up of transparent ice particles, opaque? Why is this paper opaque, notwithstanding the fact that the fibers of which it is composed are practically transparent? The answer is that a snow ball is made up of ice particles and air spaces; and this paper represents a matting of minute fibers, with innumerable air spaces separating them. In short, we are here dealing with

heterogeneous rather than homogeneous structure, and the imprisoned air is the cause of the opacity. It is the air in the paper, therefore, which makes it look white, that is, causes it to reflect scattered white light. To explain this we must refer to the subject of refraction: When a ray of light passes through a medium, the ray alters its original course, and the degree to which it is deflected from its course depends upon the density of the medium through which it passes. Scientists in this connection speak of the index of refraction; and in case of ice and air, and fiber and air, there is a marked disparity of the indices of refraction. The light would, therefore, have to zigzag through a snow ball. The result is that the light which actually enters the snow ball is lost (absorbed) within it, while a considerable portion of the impinging light is reflected from the surface, and for the reason previously mentioned, is reflected as scattered light. If we place a drop of oil upon white paper, it ceases to reflect much scattered light, and the paper becomes virtually transparent, for the reason that the oil, which displaces the air, happens to have a refractive index approaching that of the fiber. So it is not merely heterogeneous structure, after all, but rather the difference between the indices of refraction, which accounts for the opacity of most bodies made up of particles of dissimilar substances. Naturally it does not often happen that such substances occurring together refract light to the same degree.

At this point we may profitably perform a simple experiment. Suppose we crush some common glass, and place the particles in olive oil. The glass particles will be found to appear less conspicuous because the spaces between them will now be filled with the oil, which displaced the air and oil has nearly the same index of refraction as has the glass. If we then carefully add cassia oil, a little at a time, the glass will finally become invisible, and the heterogeneous body will be transparent. The reason is that the index of refraction of the one oil is a little lower than that of the glass, and the other a little higher, so that a mixture may be made of the two having the same index of refraction as that of the glass, at which point the latter is invisible.

Certainly it is reasonable to assume that in heterogeneous structures found in nature, we may expect components of dissimilar indices of refraction. Hence bodies of such structure may be expected to be opaque, and to reflect a considerable portion of the light which strikes them. Observation proves that this is really the case.

We can now understand why cotton, which is a hollow tube filled with air, looks white; why fluffy clouds against which the sun is shin-

ing, look white; why a liquid made up of minute globules of oil floating in water—a liquid commonly called an emulsion—is white. We can understand also the "whiteness" of soap lather, of whipped egg-white, of froth generally, of ivory soap, and of other substances into which air has been beaten. Nor need we be surprised to learn that white flowers contain no substance which is inherently white, and that the whiteness of the lily is a structural effect. The same is true also—and this can be proven—of white hair and of white feathers.

In order that the reflected light may be white, absence of pigment is of course essential. If pigment is present, its color may be considerably modified by the structure of the body in which it exists, this influencing the amount of white light reflected which dilutes the color. This is the case in leaves and flowers, in the feathers of birds, and in many other objects in nature. Human hair is darker when it is oily, just as oiled paper is darker, and appears lighter in tint when the oil has been removed by thorough washing. An analogous example is to be found in flamingoes. The depth of red color exhibited by these showy birds has been proven to be dependent upon the amount of oil in their feathers, which decreases the amount of white light reflected, and thus makes the red pigment more conspicuous.

Color Effects Due to Size of Particles

An interesting fact is that particles floating in—or imprisoned in another medium, if they are sufficiently small, so that their diameter is comparable to the length of the light-waves composing the visible spectrum, and appearing as white light, may selectively absorb certain wave-lengths, and thus give rise to color. Thus, skimmed milk, as everybody knows, appears distinctly bluish by reflected light, and de-vitrified glass sometimes shows a similar effect. The blue color of bird feathers, namely of the blue-jay, of the indigo bunting, and of certain tropical birds, has been shown to be a purely structural effect, and is attributed to minute bubbles of air imprisoned in the transparent "feather-substance." Indeed, no blue pigment has thus far been separated from feathers. Moreover, that the structural blue of feathers may modify the color of existing pigment, has been shown to be the case in green feathers from which a yellow pigment may be extracted, leaving the feathers blue; and biologists have observed a similar color change in case of certain frogs, which in preserving-alcohol turn blue, due to the removal of their yellow pigment.

It is evident, then, that in the vegetable and animal world struc-

tural color effects are so important that they cannot be ignored, and that pigments may be but a factor, and not by any means the only factor, in producing the colors which we see.

Now when we speak of pigments in connection with plants or animals, we mean as has been stated, a substance which by virtue of its *chemical* nature is capable of selective absorption of light-waves, thus producing color. And for sake of convenience we include in the category of pigments also black substances which absorb *all* the rays of the visible spectrum. Thus, the substance to which is due the black color of the skin of the negro, is referred to as skin pigment, as is also the coloring matter in black hair. But strictly speaking, black is not a color, for black substances do not absorb light waves selectively.

In the hairs of mammals are found pigments ranging from yellow to red, which may be mixed in various ratios with each other and with a black substance, giving rise, accordingly, to numerous shades of yellow, yellowish-red, and brown. There are, of course, no blue or violet hair pigments. In other words, the short waves of the visible spectrum are absorbed by hair pigments, and the longer waves are reflected—that is, if there is selective absorption. If there is no selective absorption, but absorption of all the wave-lengths of the visible spectrum, the hair is black.

Of special interest is the pigment of the human skin. Unfortunately, but little is known about it. We speak of the white races, the yellow or Mongolian, the red or Indian, and the black or African. Our scientific books give us a name for this pigment, the name melanin, information which does not help us much, for the name is nothing more than a derivation of the Greek word melas which means black. It is known, however, that melanin is not a pigment derived from food, as is the yellow pigment in the feet of a Plymouth Rock chicken, but is developed in the living cells of the skin by a process involving the action of light, not only of visible light, but also—and indeed, particularly—of the ultra-violet rays. The tendency to develop skin pigment is not limited to the colored races, and even the blond Nordic will tan or freckle. There is, however, a very marked difference in individuals in their reaction to sunshine, and some develop skin pigment rapidly, while others tan very slowly. Some tan uniformly, and others freckle. Why this should be the case is not definitely known. We know only that in sun treatment for tuberculosis, and other ailments, the beneficial effects are most marked after

high pigmentation has been effected. And we know also that if the skin is covered with a cosmetic containing a fluorescent substance, namely a substance capable of altering the wave-lengths of ultra-violet light, tanning is practically or nearly impossible, which proves that the ultra-violet rays are the important factor in this skin pigmentation. But how a person with the tendency to freckle may contrive to tan uniformly is still an unsolved problem of science.

Let us now shift our laboratory from the "zoo" and the bathing beach to the woods and the fields, where we may hope to be more successful in dealing with our problems in a scientific manner.

Vegetable Colors

The colors of vegetation are endless in variety, presenting all the hues of the spectrum, their tints and shades, with numerous blendings, altered, moreover, by the effects due to structure. And when we view a landscape from a distance, preferably from an eminence, it is not only *minute* structure which must be taken into account, as influencing the general color effects, but also gross structure which becomes a factor in the case. Note for example the breezes billowing a field of ripening grain. Do not the colors change, becoming lighter and darker before our eyes? And does not this remind us of plush or velvet, when brushed with the nap, or against it?

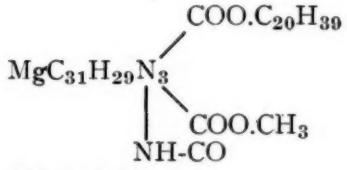
But why does velvet appear darker when we have brushed the nap against the grain? We may answer that we have caused the fibers of the nap to stand vertically, a condition conducive to the "trapping" of light, and to multiple reflection, back and forth, from one colored fiber to another, with the result that practically no white light is reflected with the color. Probably an experiment will help us to understand this. Suppose we impale a number of bright steel needles in a specie cork, placing them close together, and with points upward. When we look at the group of needles from above, it will appear black, while any individual needle, seen from the side, appears white, like polished silver. The single needle appears silver-white because a great deal of light is reflected from its surface. But when light filters in between the needles arranged in a group, it is trapped, and does not again emerge; so we have an effect comparable to the absorption of light by a black pigment. And in like manner a forest seen from an aeroplane, or a field of grass viewed from a high hill, will appear very dark green, nearly black, while the same landscape from a lower angle will exhibit much lighter colorations, just as our

grain field reflects more light—white light mixed with the green—when the wind bends the stems, and on the other hand absorbs more light when the stems stand up vertically, and correspond to our line of vision.

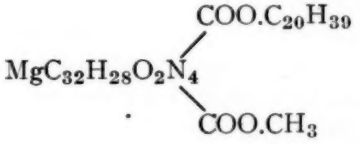
Vegetable Pigments

Of vegetable pigments we now have some definite information particularly in regard to chemical composition—not of all of them, by any means, but of certain very important ones. First of all let us consider leaf-green, to which is due the dominant color of the summer landscape. That leaf-green, or chlorophyll, plays a part in the normal functioning of plants, and that it is not merely decorative, to please the appreciative eye of man, has been known for more than a hundred years. But a knowledge of the true chemical nature of this pigment dates back only to 1912. It appears that there are really two chlorophylls, the one designated as chlorophyll *a*, the other as chlorophyll *b;* and that the latter is the oxidation product of the first. This pair of chlorophylls seems in fact to present a parallel to the hæmoglobin and the oxy-hæmoglobin of the blood, and like the blood constituents seems to pass from the one to the other form, and back again, in connection with the normal life processes.

Chemically the chlorophylls are ester-like compounds of carbon, hydrogen, nitrogen and oxygen, and contain also a metallic element, namely magnesium. Here again we observe the analogy to the blood pigment, which however, contains another metallic element, namely, iron. Yet while the chlorophylls contain no iron, it is a strange fact that these plant pigments will not develop if the soil in which the plant grows is devoid of this element. The formulas worked out (by Willstätter and others) for the two chlorophylls are these:



Chlorophyll *a*



Chlorophyll *b*

If we condense these formulas to—

$MgC_{32}H_{30}N_4O$ $(COO.C_{20}H_{39})$ $COO.CH_3$ for chlorophyll *a*, and $MgC_{32}H_{28}N_4O_2$ $(COO.C_{20}H_{39})$ $COO.CH_3$ for chlorophyll *b*.

we can see at a glance that the latter differs from the first in that an extra oxygen has replaced two hydrogens.

In the synthesis of carbohydrates in a plant, that is their formation, from water and carbon dioxide of the air, a process in which light figures, and which is therefore called photosynthesis, the chlorophylls utilize, besides the ultra-violet rays, certain wave-lengths of the visible spectrum, and the blend of the unabsorbed wave-lengths gives to the mixture of these pigments their characteristic green color. (In deep water plants the pigment adjusts itself to the modified light, hence such plants are usually not green, but are apt to be red or purple.)

The amount of carbon dioxide abstracted from the atmosphere by this mysterious function of the chlorophylls, though small in any single leaf, is very large in the aggregate, and roughly compensates for the change in the opposite direction due to respiration by the creatures of the animal world and by human beings. It has been calculated that to offset the breathing of a man, about thirty square yards of leaf surface are required; and since photosynthesis is operative only in the daytime, and since over vast areas the vegetable world is dormant for nearly half the time each year, it is necessary to multiply the thirty square yards by about four or five, in order to arrive at the leaf surface necessary in the growing season to compensate for the breathing of a single human being. It has been estimated also that if the absorption of plants were not counterbalanced by animal respiration, and by industrial processes, which return carbon dioxide to the air, this constituent would disappear from our atmosphere in about thirty-seven years, at which point photosynthesis would automatically cease, and all life would become extinct. As a matter of fact, however, the carbon dioxide balance is pretty evenly maintained from year to year.

Yellow Pigments

Vegetation as has been stated presents many shades of green, from the dark and sombre green of the pine to the yellowish-green of the willow or birch. Indeed, as our powers of observation become more acute by training, we note that different kinds of grain, as oats and wheat, and certain grasses and sedges in the meadows, are easily distinguished from a distance because of this variation in their depth of color or in the tint of green which they exhibit. We know now that structural effects play a part in these phenomena. We may surmise also that in some plant forms leaf green is more abundant than

in others, and that the ratio of chlorophyll *a,* which when separated, is a bluish-black pigment, to chlorophyll *b,* which is dark green, may vary within certain limitations. But these assumptions do not satisfactorily account for the yellowish-greens which are particularly conspicuous in the spring time, and which are in evidence more or less throughout the summer. Moreover, we must account for the fact that when autumn comes, the leaves of many trees and of other plants change to a distinct yellow. Either yellow pigment must exist in the leaves, or it must be developed from leaf green on the approach of cold weather.

But the plant chemist has solved this problem definitely by demonstrating the presence of yellow pigment in the green leaf. And strange to say there are two yellow pigments known to exist just as there are two chlorophylls, the one yellow substance having been found to be the oxidation product of the other. Their chemical composition is, however, very much simpler than that of the chlorophylls. The one yellow pigment is a hydrocarbon, therefore containing only carbon and hydrogen, and has the formula $C_{40}H_{56}$. It is an unsaturated hydrocarbon, containing less hydrogen than the maximum possible in view of its forty carbon atom, and therefore has some of its carbons linked to their neighbors by multiple linkage, a fact which undoubtedly accounts for its ability to selectively absorb light-waves, and to exhibit color. This hydrocarbon pigment was first separated from yellow carrots, and was accordingly given the name carotin. The other yellow pigment differs from carotin by the addition of two oxygen atoms, and has the formula $C_{40}H_{56}O_2$. It has unfortunately been given a rather pedantic name derived from the Greek, namely the name xanthophyll, which means leaf-yellow, although its distribution is not limited to leaves.

Now what is the purpose of these two yellow pigments which are so universally associated with the chlorophylls in the leaves of plants? Whatever function they may have in flowers, quite obviously they are not primarily ornamental in leaves where their colors are so largely obscured by the more abundant chlorophylls. It would appear, rather, that they are connected with plant metabolism, and that they play a part in the all-important bio-chemical process of photosynthesis by which the living plant cell converts carbon dioxide and water into carbohydrate, the substance which accounts for the great bulk of vegetable tissue. In short, we may say that in some manner the function of the yellow pigments links up with that of the two chlorophylls.

It seems strange that colors and pigments should figure in the growth of vegetation. But we must remember that color is but the visual evidence of the selective absorption of light waves, and that the absorption of sun-energy is the basis of all life. To be sure, a single blade of grass absorbs but a small amount of radiant energy, and produces but a small amount of carbohydrate. It has been determined that to produce about a gramme of carbohydrate per hour, when the sun is shining, and the temperature is favorable, a whole square yard of leaf surface is required. In the aggregate, however, the yield of this product is truly collossal, for carbohydrate, in the form of cellulose, constitutes the bulk of plant tissue. The trees of our forests, the vegetation of our fields and of the tropical jungles, are built of material produced in the tiny chemical laboratory, the plant cell, by the process of photosynthesis. And how closely this abundant plant substance carbohydrate links up with human life! We clothe ourselves in carbohydrate—in the form of cotton and linen and artificial silk. We live in houses—many of us—of carbohydrate, namely, of wood. In a carbohydrate ship Columbus discovered America. And as for our food—there would be no food, if these green and yellow pigments did not provide it by photosynthesis. Even though we were to become wholly carnivorous, or were to limit ourselves to a milk diet, we would still be dependent upon the product of photosynthesis. There were times, as we know, when the prairie Indian lived solely on buffalo meat; but the buffalo lived on grass, and the grass grew because of photosynthesis. And even in our day and age, as we sit down to dinner, we find that every item on the bill of fare, with the sole exception of the sodium chloride in the salt cellar, harks back, directly or indirectly, to carbohydrate production in the living plant cells, hence to the green and yellow pigments which function in capturing the sun's energy for this chemical process.

The manner in which the two pairs of plant pigments, the chlorophylls and the two yellows, function in photosynthesis is still a mystery, and no one has succeeded in duplicating this bio-chemical process in an artificial way. Nor do we know how the pigments are produced in the plant cell. But we do know something about their distribution, and about their quantities as found usually in common plants and vegetables. It is known for example that the pigment obtainable from dried leaves averages about 1 per cent. by weight; and of this the larger portion by far is attributed to the chlorophylls, which run about eighty-five parts to every fifteen parts of yellow pigment. Of the

chlorophylls the *a* variety is about three times as abundant as chlorophyll *b;* and of the two yellows the xanthophyll is the more abundant, there being nearly twice as much of this pigment as of carotin in the average green leaf. As has been intimated, carotin and xanthophyll are not confined to the leaves but may occur in more or less abundance in other plant parts. Thus in the squash and the pumpkin, in the rind of lemons, in the fleshy root of the carrot we observe yellow pigment in abundance.

There is also a red carotin which bears the name lycopin, and which accounts for the red color of the skin and pulp of the ripe tomato, the skin of red pepper, and the pulp of the watermelon. Lycopin has precisely the same chemical composition as ordinary carotin, namely $C_{40}H_{56}$, although the atoms in the molecule no doubt are grouped differently in the red pigment than they are in the yellow. As chemists express it, the two substances are isomerides, that is, are isomeric, one to the other. There are probably yet other varieties of this interesting hydrocarbon, as there are also close chemical relatives of xanthophyll.

Carotinoids

Collectively, these yellow to red pigments of the formulas given, and of closely related composition, are known as the carotinoids. In the leaves the carotinoids are usually not in evidence when chlorophyll is present in normal quantity, although they may tend to modify the tint of green which the leaf exhibits. This applies also to the skins of such fruits as the cucumber, squash, pumpkin, and others, which are green until they ripen, when they turn yellow because at that time chlorophyll production slackens, ultimately ceases, and the unstable green pigment disappears by decomposition, offering the carotinoids the opportunity to come out of hiding. The same explanation applies to the development of the golden yellow color of certain foliage on the approach of cold weather in autumn, and yellow carotinoids account for the characteristic golden glow which the birch, chestnut, poplar, tulip tree, mulberry, oriental sycamore, willow, elm, and other familiar trees contribute at that time of the year to our landscapes. A red carotinoid is in evidence, in the winter time, in case of certain evergreens, as for example in the arbor-vitæ, which does not lose its green pigment, but which in cold weather possesses a smaller quantity of it, thus giving the carotinoid the chance to peek through.

And as for flowers, a large number owe their coloring to carotinoids: the forsythia, daffodils and nasturtiums, yellow-red tulips, sun flowers, buttercups, mustard, gaillardia, yellow roses—and a host of

others, ranging from lemon yellow to bright red. So it appears that these pigments are not only vegetative, that is, operative in the metabolism of the plant, but are also of service in connection with cross fertilization, for colors, it has been proven, are the chief attractions for the insects, more important than the flower-odors from this standpoint. Incidentally, it might here be mentioned that yellow may be seen farther than any other color;—at least this is true with respect to human vision.

As may be surmised, the carotinoids, so generally distributed throughout the vegetable world, find their way into animal tissue and animal fluids. Thus, cow's milk, in the springtime, is yellowish, and the butter obtained from it is richly colored. And beef fat is also more highly pigmented as a result of the feeding of green food, like alfalfa. In the yolk of eggs, the fat of fowls, and also in the skin covering of their feet, we find variable amounts of carotinoids. Furthermore, it has been observed that when a hen stops laying, this skin pigmentation becomes more pronounced, thus affording a means for the identification of those members of the flock which have discontinued paying their board bill, an observation which the poultry man makes use of in a practical way, when he selects the victims for the broiler.

In fish and in the crustaceans carotinoid pigments are common. In case of the flounders, which are usually free from pigment on the left side on which they lie, and are highly pigmented on the other, it is known that the side which the flounder turns to the light is the pigmented side; and when flounders are placed in a glass-bottomed tank, with electric lights beneath it, the side commonly white became pigmented also. So it appears that in the flounder, as well as in case of the freckled boy, the light plays a part in the production of pigment.

That we consume a considerable quantity of carotinoids in our food is quite obvious; but it seems that these substances are entirely harmless, for no one has observed untoward effects following their ingestion. We may, therefore, eat pumpkin pie, and egg custard, corn bread and spring butter, without any apprehensions as regards the effect on our well-being.

Whether carotinoids in animals are always derived from vegetable food, or are produced by chemical action in the living cells of the pigmented animals, is an interesting question. It appears that carotinoids are in most instances at least obtained from the food, and their quantity is augmented by a diet rich in these vegetable pigments.

This has been proven in extensive feeding experiments with domestic fowls, and also with Jersey cows. That spring butter is richly tinted, and that egg yolks are yellower when the hens can eat grass and "greens," is an observation most of us have made.

The ingested carotinoid does not appear to be distributed uniformly in the animal tissue, but to accumulate principally in the fat and in the skin. And, strange to say, sheep and goats, despite their herbiverous habits, are practically free from such pigments, their fat being colorless. Why this is the case is not known.

The Flower-blues, or Anthocyanins

The term carotin is derived from the name of the common vegetable in which it abounds, the common carrot; and all carotinoids may be thought of in connection with carrots and pumpkins and red tomatoes. Now an entirely different group of vegetable colors ranging from red through purple and violet to blue, is included in the group of anthocyanins, a Greek name, meaning flower-blues, although these pigments are not limited to flowers, and are not necessarily blue. The red beet contains an anthocyanin; so does the skin of the grape; so does the skin of the apple. Indeed, the majority of our luscious fruits appear so tempting because of skin and pulp pigment classifiable as anthocyanins.

These pigments have a rather complex chemical structure, but are chemically related, and have certain properties in common. They are classified as glucosides, because the molecule of an anthocyanin can be decomposed so as to yield a glucose, namely, a sugar—and it may be remembered that a sugar of this type is the first carbohydrate produced in photosynthesis. The sugar combined in anthocyanins may be dextrose, or galactose, or rhamnose, but it is always one of the type which the chemist classified as a hexose—a sugar having the molecular formula of $C_6H_{12}O_6$—a glucose-like sugar.

The typical anthocyanin is violet, and like litmus, it turns blue with alkalies, and red with acids. In a blue flower, as for example the corn flower, the anthocyanin is combined with a metallic base. In the example given, the corn flower, it is a salt of potassium. In the red pelargonium, commonly called geranium, there is a tartrate of the anthocyanin, a combination with an organic acid to form a salt. When the anthocyanin is free, combined neither with an acid nor with a base, it appears violet or purple. The violet larkspur offers an illustration of this type. The anthocyanins may, therefore, be thought of in connection with litmus paper.

Many of our most gorgeous flowers, roses, geraniums, red sage, hollyhocks, pansies, peonies, corn flowers, larkspur, petunias, poppies, zinnias, certain aster, red, old rose and purple dahlias, and others, owe their beauty to anthocyanins. Grapes, cherries, plums, raspberries, cranberries, apples, and other fruits contain these pigments in the skin or the pulp. They occur accordingly in our fruit juices, preserves, jellies and other fruit products. Furthermore, the characteristic color of certain vegetables, notably the purple cabbage, red beet and the red radish is due to anthocyanins, and extracts of these vegetables may be used as substitutes for litmus.

The fact that combinations of these pigments with alkalies are blue, explains why in the washing of a jelly glass with the help of a washing powder, which is alkaline, there may occur the aforementioned change in color; and why the color developed is sometimes green in place of blue is easily understood when we remember that carotinoids may be present also, and that a mixture of a yellow pigment and a blue one, produced green. Finally, remembering the susceptibility of anthocyanins to acids and bases, we see why the nature of the soil should influence the tint of certain flowers, for the soil has its effect on the reaction of the cell sap, and that in turn may change a blue flower to violet or even red, or a red one to violet or blue.

The anthocyanins are water-soluble, and therefore, usually occur in solution in the cell-fluid, in which respect they differ from carotinoids and the chlorophylls, which occur in solid or semi-solid bodies, known as plastids. While the beautiful pigments of our flowers are not utilized for the purpose of dyeing fabrics, a number of vegetable dyes, related to anthocyanins, are in general use. One reason why anthocyanins found in flowers are not suitable for dyeing purposes is that these pigments are fugitive and lack permanence.

White flowers are of course devoid of pigment. But there may be present colorless substances related to anthocyanins, and these may give rise to pigment upon being subjected to chemical treatment. Thus a number of white flowers turn yellow with alkali, showing the presence of compounds known as flavones. But more interesting than this fact is the susceptibility of these flower pigments to reducing agents which destroy their color, changing the pigments to more stable chemical substances incapable of selective absorption of light-waves. Reducing agents, accordingly, may be used to remove fruit stains or stains from flowers, in short, may serve as bleaching agents.

The Riot of Colors

Red, orange, yellow, green, blue and violet, the colors of the rainbow, with all possible shades and tints, are seen in our flower gardens. The green, chlorophyll; the yellow and orange, and certain reds as well are carotinoids, and the pink, rose, red, a few bright crimsons (due to acid combinations), the violet, and the blue, anthocyanins. There are of course many individual and distinct flower pigments, and a considerable number have been isolated, studied, and given specific names—names usually derived from the names of flowers or plants in which these pigments occur, as for instance carotin from carrots, delphinin, from delphinium, peonin, from peony. But the fundamental and important thing is that nearly all these pigments (with the exception of chlorophyll) can be classified in one or the other of the two groups aforementioned; they are either carotinoids, to be thought of in connection with the pigment found in the pumpkin or the carrot, or they are anthocyanins, the peculiar sugar combinations—glucosides —which like litmus, are violet in the free state, red in combination with acids, and blue in combination with a metallic base.

Autumn Colors

In the summer nearly all leaves are of some shade of green. But in the autumn when the leaf green ceases to be formed, and gradually fades away, the foliage in forests and fields develops the most gorgeous colors. And these autumn colors, also, are in the main due to carotinoids or to a mixture of carotinoids and anthocyanins. The carotinoids, as has been stated, co-exist with the chlorophylls, but are more resistive to decomposition than the latter, and appear in their full beauty when the life processes in the leaf have slowed down, and the leaf green has disappeared. The anthocyanins, on the contrary, are not normally present in summer foliage. Their formation comes about when the sugar-content of the leaf increases, due to a slackening of the circulation of the plant sap, and when the sugar which is formed in the cells in the leaf is no longer transported to other parts of the plant, and thus banks up. If an injury to the branch, either of mechanical origin, or due to disease, interferes with the sap circulation, autumn colors will appear prematurely in the leaves affected—a common phenomenon in our forests and orchards. Of course, sunlight is also a factor in the development of autumn colors, for without sunlight, anthocyanins will not be formed, even

though the sugar content be adequate. Hence the shaded leaves will not change color as rapidly as do those which are directly exposed. The same is true in case of fruits, like apples, which do not turn red with anthocyanins unless they receive direct sunlight—are sun-kissed.

Yet another factor in autumn coloration is found in the weather conditions. If cold weather comes suddenly, and while the leaves are still full of sap, anthocyanins will be formed in great abundance, and the sassafras, sumac, sugar maples, gums, and the oaks will present their finest autumn display of deep crimson. If on the other hand, dry weather prevails, and the cold comes very gradually, but a meagre quantity of anthocyanins will appear, and our October landscapes will prove disappointing, for the leaves will slowly dry up and drop off, without having developed pronounced autumn colors.

In case of flowers richly colored with anthocyanins, we may presume that their pigments serve a purpose in the cross fertilization by the aid of insects, and hence in the perpetuation of the species. But in autumn foliage these plant constituents seem to be merely the product of modified metabolism, not particularly useful to the plant, but certainly making a striking appeal to all who love beauty. For what flower garden can compete with the wonderful color effects of our autumnal forests, golden with carotinoids, and crimson with anthocyanins! Unfortunately, these gorgeous pigments are evanescent and soon fade, a change which is due to ferment-action and to oxidation. The leaf changes color gradually to a dull brown, or grayish-brown, loosens its hold, flutters away, upon the keen November winds, to its final resting place, and the tree prepares for its long winter sleep. But in the springtime, when the warm sunshine awakens the tree to renewed life and activity, the sap again rises, the leaf buds unfold, the tiny laboratories which we call cells again enter upon active production, and chlorophylls and carotinoids, and anthocyanins, too, appear once again, giving to our vernal landscapes the same general color effects—though softer and more subdued—which gladdened our hearts in the fall preceding. And once again the willows and poplars and birches are mustard yellow, with the carotinoids showing through the green, while the tender young leaves of our oaks and other trees which turn crimson in the fall, are in the springtime a beautiful rose red, pigmented with anthocyanins, destined to disappear when chlorophyll develops in abundance and photosynthesis progresses in a normal manner. And thus winter, spring, summer, and fall of the leaf, year after year, to the end of time—each season with its own appeal to the eye which loves beauty.

WHITHER*

By William D. Wadsworth, M. D.

Coroner's Physician, City of Philadelphia

WHILE I knew I was no longer young, the invitation to address you today came as a shock. I had not realized that I had reached that advanced age which made it proper to inflict the result of long experience on the graduating classes and their friends. The great and abiding interest I have long had in all the medical arts and sciences prevented me from assuming any false modesty. I look upon the pharmaceutical branch of the medical arts and sciences as one of the most important branches.

I shall regard any separation of that branch from its vital connection with the great group as a calamity not only to pharmacy but to medicine and the public.

It is therefore a privilege to speak for unity not only of material interest but of ideals and for the most serious and earnest consideration of those things which are the hope, as well of those things which threaten disaster to us all.

We must face what is ahead with high purpose as well as the wisdom of experience and not rely wholly on technical knowledge.

It would be interesting and profitable if time and place were suitable to trace the growth of medical arts and sciences from the tribal shaman, from the medicine man who did everything that was done, down or up, to the present outlook.

I shall not attempt to do any such thing now but I want you to think of that fascinating history of how, through the centuries, the development has gone on—from the one man general practitioner there came to be such a vastly complex group of specialists.

Think of the blunders as well as the progress and consider why each was what it was.

You who are to go out into the future—you in whose hands the future of your profession is to be—can well afford not only to look back over your years of preparation and take stock of your own growth, but in the light of your own development to consider that of your profession.

*An Address given at the One Hundred and Fourth Annual Commencement of the Philadelphia College of Pharmacy and Science, June, 1926.

You have received much from others, but only as you have responded to the efforts of others are you the better prepared to do and to be.

So with the profession at all times, leaders may arise but it profits not if there are not those who are led.

Today you stand, because of the high efforts of your teachers, ahead of the rank and file of your profession. By reason of their leadership you have been in a way projected into the future so that you will still be ahead for a few years even though you neglect to grow as you should. One might even say you can review the past in the light of the future and I most heartily recommend that you cultivate the habit of now and then looking back. This will not be unprofitable because progress in all things is a sort of spiral where coil after coil—like the roadway of the Swiss Alps—where the train in its progress climbs by slow grade not rarely plunging into the darkness of a tunnel, emerging into the light at a point above the point of entrance.

So the past of science and art has its dark tunnels, where the only progress made by a long run through hopelessly dark periods, is upward.

Learn from the past how progress was made and against what sorts of obstructions progress must always struggle.

Of this you may be sure—the rest of the world is not going to sit still, no matter what you do. If you sit still or by reason of misdirected effort become fossilized you will not only sink to the bottom but will fall to the rear.

Of this also you may be assured, that your profession is too important to be left behind as a whole—there will arise men of force, of wisdom, of purpose, who will keep pharmacy in its place, so that at most you will only be a drag in that progress if you neglect your duties and do not fulfill your opportunities.

I need not point out to you that your school has a very honorable past. It is not simply one of the great schools of this country, it is the greatest and it has a record that makes it one of the most significant forces in the whole profession.

It has produced men who have been a credit not only in the business of pharmacy, and that is a highly reputable one, but there are names of men that rank high in science and in the affairs of men in the community in which they lived.

I would be running false to the past of your Alma Mater if I was satisfied with considering your future simply on the lower planes of business success.

I would be failing of my duty here today if I held back from bringing clearly before you those duties of the higher sort—those duties, which if performed, raise pharmacy to a great profession, but if not performed it will sink to the level of a vulgar trade.

I am glad to believe that you will not be able to choose for the profession—that will go on and up. What you can and must choose is whether you will be with that party in the profession that is creditable or that which is discreditable.

I am not here to discourage you by tales of the dirty abominations that have been wrought in the past within your profession, nor do I think it proper to lay too much stress upon the temptations you will meet all too soon, to dishonesty and dishonor that are the shame today of pharmacy.

I could tell a story very harrowing to hear, for I know far too much to remain entirely silent. It is enough that knowing pharmacy as it is today, I can honestly assert a strong optimism for the future.

Youth and age are the times for vision. Youth by reason of innocence and elasticity hates pessimisms. Age, if it comes after real struggle and wise study, sees the balance of forces of good and evil and the hand of guiding wisdom and knows that there is a purpose not to be checked by the separate or combined activities of the ignorant, and the bad, or by the neglect of the shiftless.

I shall always hold in high esteem a saying of a vegetative sort of female poet, or versifier, to a prose writer of vision after a talk in which there had been a real heartburst—"If I believed as you believe, I should fear nothing." That after all is the real thing.

If you believe the right thing you will fear nothing. If you are color-blind you must take color on faith, but it will be unwise for you to consider yourself an authority on color even if Dalton, the so-called discoverer of color-blindness, was himself color-blind.

If you are spiritually blind, count yourself unfortunate as is the color-blind person. Retain a proper modesty such as belongs to defective persons, but unfortunately, defectives are seldom modest about anything. Above all things, if you are spiritually blind do not set up as a special oracle on spiritual subjects.

Nor is this topic apart from your life work. If you think you can master the significance of anything human without considering its relations to other things human, you commit the highest type of unreason.

If you think you can play pharmacy without large understanding of its relations to the rest of medicine you will assuredly commit folly; nor can you ignore the vastly intricate social problems that will cross your path whether you wish it or not.

You will very early learn that there are moral problems in your profession which demand a definite stand on your part—if you drift, it will generally be down and not through. Mark me, I say moral not ethical problems. The moment we drop down from moral to ethical that moment we become fakes. What is right is that which is in keeping with the eternal fitness of things, in harmony with the vast and vastly intricate plan in which we find ourselves.

What is "ethical" is largely the whim of some philosophical fancy long teased out. The profession that steps down from moral grounds to toy with ethics is in need of that lash of scorpions that sooner or later it is going to get.

Don't forget that pharmacy has done just this thing in the past.

Don't forget that more than once, and that not always in the dim historic past, has pharmacy played sophisticated ethics until the community rose in its wrath and made hard laws.

It would have been easier for the whole profession if the narcotic problem had been treated as a moral one by the profession but as they fell down, there came law and now all must bear the ignominy and annoyance of being under the law.

There are problems today that are in the balance—choose whether they will be met by you as men or whether you, having been found wanting in moral stamina, will be put under law.

A vast vista of do's and don'ts rush past me as I think of what you are about to see and be. I am seriously tempted to stop a moment to tell you of some that I know are most real and by which your careers will be in great danger.

Setting aside this urge to specify, let me insist instead on a few simple maxims pointing to principles that will be fundamental and help you to care for details.

If you know drugs better than some physicians do, you do not know physiology, pathology and therapeutics, therefore there is strong presumption you are not fit to prescribe.

Who shall say which are simple remedies? Fresh from the intensive studies of up-to-date courses, you have assurance—be careful you do not overstep your knowledge and be smart.

My studies began before you were born and during all those years I have studied hard and under as high guidance as was to be had and today I dread my ignorance—you may well be cautious. Discriminate between that self respect and confidence which is justifiable and the emotional variety that is inexcusable.

If you had seen what I have seen, in your own profession, result from unpardonable vanity, you would realize that what I say is far more than funny, it savors of awful tragedy.

When you are handling deadly drugs your errors—be they of ignorance, carelessness or vanity—are far more serious than if you are selling odds and ends in a department store.

I will mention one tragic detail in this connection—do not take your own drugs. Of all horrors of pharmacy this is, in my mind, one of the most real and terrible. Resist the temptation as of deadly sin. It begins so easily with simple drugs and goes on so insidiously, you may not dare to begin.

Take care of your personality. Life is easier to talk about than to live but as I look back over the road that I have come I see the path strewn with failures, too often from obvious and avoidable causes, to dare to neglect to tell you to avoid certain types of failure.

As a routine practice, take care of yourselves, not as bottles in a glass case but as living human beings—body, mind and soul. No part can be neglected without affecting the rest—each needs exercise, nourishment, variety. Avoid fads and excesses. Work hard. Relax hard. When I say "variety" I do not mean nurse crazy excitements.

No two of you are alike—some are too placid and need stimulus —some too wild and need routine to quiet on.

When I see a silly flapper yearning for fifty miles an hour, I laugh, for are we not spinning along a bit in space? Pittsburgh is now where we were when I commenced talking. Are we not going round the sun at nine miles a minutes?

To those who have human qualities of mind, science has enough that is exciting. I can sit at ease in my little back yard and get a thrill out of the stars, or I can consider the high spun philosophies of ultimate matter. I find such entertainment worth while—cheap, pleasant and beneficial. Let no man lack pleasures, no matter how poor, if he cultivates his mind and soul.

I am often tempted to say a word about **human engineering** and I know of no more appropriate time than the present. You are by profession deeply interested in the whole health movement.

There are problems of public health that have not yet been featured, some of which vitally affect your work. Be, therefore, alert in the whole field. Make one of your hobbies the varied relationships of your profession. Use your special knowledge to help the public solve its health problems.

It might be well if you put your back rooms in order and kept things clean and in order before the board of health closed the places as it should in not a few shops in this city today.

Do not imagine **human engineering** has no interest directly for you. If you do not keep yourself in condition you will suffer sooner or later. It is usually the uncared-for clerk who makes the ruinous mistake, but not always.

It is the duty of every member of the profession to take a positive stand for proper hours and conditions which will not harm the workers.

A certain merchant in this city taught the world the desirability of sanitation and real **human engineering** for all—employer, customer and employe. The world is slowly learning the lesson. Your profession has yet much to learn in these matters.

You must all agree to take up this work—not in the ruinous greed of trade unions of the past—but as co-operators in helping along vital improvements that will lift the profession in all its parts and make it more efficient in its service of the public.

Do not imagine that the learning you have stowed away will suffice you very long. Things are moving swiftly and even if all you learned was correctly learned or if it was entirely correct as taught and you had nothing to unlearn, there are coming many new things you may not ignore. Be sure to have a good up-to-date journal on your desk.

You will do well to have a desk where you can study for yourself and where your employees can study. If you are employers try to recall the old spirit of the apprentice days, as found in the better places.

Unite to combat the degrading influences of the reckless, low, commercial element that seeks only to squeeze the pennies.

Form yourselves into a mutually protective body that, with tolerance and sanity on one hand but force and character on the other,

determines that the profession shall not be degraded by ignorance, recklessness or viciousness.

You will have plenty to do, but do it.

Hold fast to the morals in the practice of your business and make it a profession.

Do your whole duty, and God be with you.

THE IMPORTANCE OF THE PHARMACOPŒIA TO THE MEDICAL PROFESSION*

By Charles H. LaWall, Ph. M., Sc. D.

THE PHARMACOPŒIA is the connecting link between the practice of medicine and the practice of pharmacy. It is as necessary to the one who prescribes as it is to the one who dispenses. Standardization of remedial agents, so that uniformity of composition results, is the indispensable factor without which the successful practice of the healing art is as futile as the attempt to solve a mathematical formula in which one of the unknowns is a variable.

The statement frequently made in former days to the effect that "the practice of medicine consists in the administration of drugs of which we know little into bodies of which we know less" is no longer true, for the research work done in recent years along the lines of physiological chemistry and the chemistry of drugs has developed a high degree of scientific accuracy in medicine and in pharmacy.

The earliest pharmacopœias were largely voluntary compilations made by individuals who sought to preserve the occult and the mysterious rather than the definite and exact. Later developments in pharmacopœias showed an appreciation of the need for uniformity in medicines, but the development was hampered by geographical distinctions and prejudices.

Each city or community of note had its own pharmacopœia for which the formulas were selected by individuals or committees who sought to perpetuate what seemed to them to be most satisfactory with little or no thought of intercommunity standardization and no attempt to determine composition or efficiency by any scientific tests.

A little more than a century ago there were upward of one

*Presented at the Annual Meeting of the American Therapeutic Society, in Philadelphia, June, 1926.

hundred of such community pharmacopœias in Europe alone. Evolution and simplification have reduced this number to about a dozen, all of national authority. In addition to this lessened number of pharmacopœias, there has been developed a co-ordination of effort in the direction of uniformity of strength of potent remedies, which insures international identity of composition and potency in a great many widely used drugs and preparations. There was a time, only a few decades ago when the tinctures of such powerful drugs as aconite and veratrum were nearly four times as strong when made according to the United States Pharmacopœia method, as those manufactured by the formulas of any other pharmacopœia in the world. Such inconsistencies as this are no longer possible under the present system of pharmacopœial revision. This improvement has been brought about by international conferences, held periodically for the purpose of unifying standards of potent drugs and preparations.

There is a wide gap in time between the pharmacopœia-like compilation of Valerus Cordus in the sixteenth century, and the U. S. P. X. Many pharmacopœias in many lands have come and gone since then. The therapeutic graveyards of the past have not even headstones or markers for the thousands of worthless drugs that have been buried in oblivion during the intervening centuries.

The United States Pharmacopœia has just completed its first century of existence. It was initiated and compiled by physicians alone, and the first revision was conducted by them without any aid from pharmacists. The second revision, in 1840, was largely based upon pharmaceutical assistance, and from that time to the present pharmacists and physicians have worked shoulder to shoulder in each successive revision. The eight revisions that have been issued under the joint authority of these two co-ordinated groups constitute an imperishable record of medical and pharmaceutical progress.

One has but to compare the U. S. Pharmacopœia of 1820 with the U. S. P. X to realize the degree to which science has replaced empiricism during the past century, and when one critically examines the intervening volumes the successive steps may be traced as definitely as the scientist determines the history of the earth from the successive rock strata deposited during the geological time of their formation.

The function of these two groups of co-workers is capable of clean-cut differentiation and has now reached its highest degree of

co-operative efficiency. It is the undisputed function of the physician group of workers to determine what substances shall be included in the pharmacopœia, upon the fundamental basis of therapeutic value. It is then the function of the group of pharmacists and allied scientists to draft the monographs which shall be effective in the matter of standardization, and to introduce monographs upon such substances as are of pharmaceutic necessity in ensuring the efficiency and completeness of the work as a whole.

It may be well, at this point, to touch upon the fundamental guiding principle or landmark, from which the work of revision proceeds as a starting point. It is found in the general principles adopted by the U. S. P. Revision Convention, whose membership is composed of hundreds of medical and pharmaceutical delegates, representing the entire country. The paragraph is as follows:

"The object of the pharmacopœia is to provide standards for the drugs and medicines of therapeutic usefulness or pharmaceutic necessity used in medical practice throughout the United States and its possessions." This insures completeness of scope and prevents the limitations urged by medical radicals and therapeutic nihilists.

I will not take up the time of this meeting by discussing the details of pharmacopœia revision work. This is a matter of record in the literature on the subject which may be consulted by all who are interested. It is for me rather to discuss the influence which the pharmacopœia has, or may have, on the development of your profession and mine.

It is hardly necessary to remind the members of the American Therapeutic Society that it is largely due to the influence of radical members of your own profession that the various cults and isms have developed such astonishing strength during the past few decades. The nostrum evil which has intrenched itself more firmly than ever before, since the enforcement of the Food and Drugs Act has necessitated certain reforms regarding composition and labeling, has found its greatest strength in the combined effect of the confidence which the public has in drugs as remedial agents and the indifference on the part of many physicians to the scientific developments of plant chemistry and organic and physiological chemistry. One of your own shining lights in medicine, Dr. Llewellys F. Barker, pointed out the very dangers which have since materialized, more than a quarter of a century ago,

The Pharmacopœia provides dependable standards for drugs, chemicals and preparations of recognized worth, and there are thousands of scientifically trained pharmacists throughout the land whose professional education has been largely wasted up to the present time, because of the failure of the members of your profession to give them an opportunity to perform the service for which they were primarily trained.

In some communities the writing of prescriptions has become a lost art. Large numbers of physicians attempt to combine the dual functions of the prescriber and the dispenser to an extent that disturbs the *entente cordiale* which should exist between mutually dependent members of a group engaged in a common undertaking.

The most emphatic commentary upon the risks which such physicians run in following these false trails is found in a survey of the Notices of Judgment issued by the Bureau of Chemistry of the United States Department of Agriculture. The firms who are most frequently penalized for sending out substandard drug products are not the great pharmaceutical manufacturing houses or establishments, whose products are available to pharmacists as well as physicians, but it will be found that the ones who are most frequently convicted are those known as "physicians' supply houses," whose products are intended solely for the dispensing physician and who frequently rely upon the slight chance for detection and exposure, in the case of products not having a general market distribution, to substitute drugs or depreciate standards, or who have inadequate methods of manufacturing or control.

This is not intended as a criticism of pharmaceutical manufacturers as a group, for the majority are just as sincere and careful in their work as it is possible to be, but the criticism is directed against a system which has made it possible for establishments with clever detail men and representatives to besmirch pharmacy and betray medicine at one and the same time, due to the fact that the members of your profession who patronize them are those who are devoting their energies to buying cheaply instead of following the principles embodied in the Hippocratic oath.

The gullibility of the public as regards nostrums sold for the relief or cure of disease without the necessity of consulting a physician is paralleled only by the credulity of many medical graduates who

learn most of their therapeutics from the dogma of the detail man. Among your own authorities—Barker, Sajous, Sollmann, and many others have pointed out these perils in emphatic terms, and as an exponent of the thinking pharmacists, Dr. F. E. Stewart has for years been "a voice crying in the wilderness," pointing the way to professional salvation.

The great advantage of pharmacopœial products is their uniformity of composition and value. This has its disadvantages in one respect, concerning which physicians should be better informed. This very uniformity places all pharmaceutical manufacturers upon the same plane. If a product is of U. S. P. quality no superiority can be justly claimed for it over that of another manufacturer of equal standing and reputation. This has led to the introduction of many unnecessary pharmaceutical specialties which take the place of official preparations of value. With regard to these it is frequently difficult for the physician to differentiate between ethical preparations of especial merit and undoubted advantage and those which are made simply to capture trade for the producer, and which are either enveloped in secrecy and mystery or for which there is no actual necessity.

It is difficult to understand, for example, why there should be a double strength tincture of digitalis on the market. The demand for such a preparation is undoubtedly created for the benefit of those manufacturers who induce physicians to prescribe it instead of the U. S. P. product which the physicians of the Pharmacopœial Revision Committee have selected as the typical potent liquid preparation of this drug.

It would be interesting to discuss the so-called patent medicines (which are not patented at all), originated and sold for the most part by individuals who have little knowledge of pharmacy or drug chemistry and less of therapeutics; and also the mail order frauds, which the continuous and energetic efforts of the chemists and prosecuting officers of the Bureau of Chemistry of the United States Department of Agriculture seem unable to entirely suppress. All of these have an important bearing on the subject matter of this communication, but time does not permit of their detailed consideration.

Another interesting and pertinent topic is the question as to why the baccalaureate degree in pharmacy, which is now given of full college grade in many pharmacy colleges, is not accepted as a premedical course. Surely the college graduate, who, in addition to the necessary fundamental branches, has been educated concerning drugs,

is better qualified to become a successful medical practitioner than one who has not had such training. This is a subject worth careful study and consideration by your organization in making recommendations for changes in entrance requirements and curricula in medical education.

I do not wish to be understood as stating that the B. Sc. in pharmacy course is simply a pre-medical course. I claim that it is more than that, inasmuch as it includes not only the necessary prerequisite subjects for entrance to most medical schools, but it is a complete education in a phase of scientific work which medicine cannot afford to overlook or neglect.

But let me bring to a close this somewhat discursive survey of an important subject by a statement which will eptomize all that has preceded.

The Pharmacopœia is the rock upon which must be built the scientific development of the materia medica of the future. The physician who ignores or deprecates the importance of the influence and the possibilities of the Pharmacopœia in this direction, or who fails to avail himself of the services of scientific pharmacy, is not doing justice either to himself or to the patients dependent upon his services.

DETERMINATION OF IODINE IN ORGANIC COMBINATION*

By C. W. Geiter, B. Sc.

IN THE U. S. P. X. there are two methods of assay for organically combined iodine.

One method is for low percentage iodine compounds, as dried thyroid (0.23 per cent. iodine): Fuse 1 Gm. of sample with 20 Gm. of molecular parts of anhydrous potassium carbonate, anhydrous sodium carbonate, and potassium nitrate until no further carbonization. Cool the mass and dissolve in water with the aid of heat. To this solution add sufficient amounts of sodium hypochlorite and phosphoric acid; boil and cool to room temperature. Then add potassium iodide solution and titrate the liberated iodine with N/200 sodium thiosulphate V. S. using starch indicator near the endpoint.

*An abstract of a thesis presented to the faculty of the Philadelphia College of Pharmacy and Science as part of the requirement for the degree of Master in Pharmacy, in course, and representing an investigation conducted in the Technical Chemistry Laboratory of the College.

The other method is for high percentage iodine compounds, as thymol iodide (43 per cent. iodine): Fuse 0.25 Gm. of sample with 4 Gm. of anhydrous potassium carbonate. Cool the mass and dissolve in water. Add enough potassium permanganate solution to effect a permanent, pink color on heating. Destroy the excess permanganate with ethyl alcohol. To a filtered, aliquot portion add sulphuric acid and potassium iodide. Titrate the liberated iodine with N/10 sodium thiosulphate V. S. using starch indicator near the endpoint.

These processes are very similar. In both, the error of observation is diminished because the quantity of iodine, just before titration, is six times greater than the amount of iodine present originally. During the fusion process the iodine is converted to potassium iodide; then oxidized to the iodate, which liberates six times its own amount of iodine from potassium iodide in acid solution. The main difference between these processes is in the use of the oxidizing agents: in one, sodium hypochlorite and phosphoric acid are used, while in the other, potassium permanganate and sulphuric acid. Each oxidizing agent converts the iodide, formed in the fusion, to iodate. The excess hypochlorite is decomposed in an acid solution, while the excess permanganate is decomposed in an alkaline solution.

The first method mentioned will detect and approximately measure as little as 0.01 mgm. of iodine, while the second method is not applicable to any such degree of accuracy. Then the question was asked, "Why not apply the assay for low percentage iodine compounds to the high percentage iodine compounds?" Accordingly, the U. S. P. X assay for thyroid was modified and applied to thymol iodide, a high percentage iodine compound. This method lessened the time ordinarily consumed, increased the degree of accuracy, avoided using an aliquot portion, and had no precipitate to deal with as in the case of using potassium permanganate as the oxidizer. Probably, two of the main reasons in obtaining more nearly perfect results were: the elimination of the aliquot portion, and the prevention of loss of iodine during the course of effervescence upon acidification.

The Modified Assay

Mix thoroughly about 0.2 Gm. of sample (previously dried to a constant weight over sulphuric acid), accurately weighed, with about 3 Gm. of finely powdered, anhydrous potassium carbonate in a porcelain or nickel crucible. Then completely cover with about 1 Gm. of

the potassium carbonate. Heat moderately, gradually increasing the heat, but not exceeding a dull redness, until the mass is decarbonized. Cool and dissolve in about 150 cc. of distilled water and put into a 500 cc. Erlenmeyer flask. Add 50 cc. of a solution of sodium hypochlorite (containing about 2.5 per cent. chlorine). Now treat the mixture cautiously with enough phosphoric acid, diluted with an equal amount of distilled water, to bring about an appreciable yellow tint of free chlorine; then add 10 cc. more of the diluted acid and boil the contents of the flask for one-half hour, or until vapors no longer react with KI starch test paper. Cool to room temperature. Add 10 cc. of an aqueous solution of KI (1:10) or enough to bring about a clear solution, and titrate the liberated iodine with N/10 sodium thiosulphate V. S. adding starch T. S. (freshly prepared) near the endpoint. It shows, in the dried thymol iodide not less than 43 per cent. iodine if it is a U. S. P. product.

Each cc. of the N/10 sodium thiosulphate V. S. used corresponds to 0.002115 Gm. of iodine.

Reactions Involved

$$\text{Organic iodine} + K_2CO_3 + \text{Heat} = KI + \text{———}.$$

$$KI + 3\ NaClO = KIO_3 + 3\ NaCl$$

$$KIO_3 + 5\ KI + 3\ H_3PO_4 = 3\ K_2HPO_4 + 3\ I_2 + 3\ H_2O$$

Experimental Results

A U. S. P. sample of thymol iodine was assayed by the above method with the following results:

Gms. used	*Cc. N/10 V. S. used*	*% Iodine*
0.1513	31.6	46.15
0.1538	32.1	46.12
0.2002	41.8	46.14
0.2144	44.7	46.07
0.4326	71.4	46.05

The factor for the N/10 $Na_2S_2O_3$ V. S. was 0.02595 Gms. per cc.

The same product was assayed according to the present U. S. P. method, and the results were, on an average, 0.42 per cent. lower.

Comparisons made of the above table with the following will substantiate the facts brought out in the work.

Thymol Iodide *Grams used*	U. S. P. X Method *% Iodine*
0.2627	45.74
0.2666	45.59
0.2776	45.69

Also, it was noted in the latter part of the present official process, that if the solution containing KIO_3 was acidified before the addition of KI, instead of the regular procedure which is *vice versa,* the results with the same sample were higher than those obtained by following exactly the standard method. Even so, the results were on an average 0.21 per cent. lower than those of the modified assay, and these results demonstrate the accuracy and delicacy of the modified assay.

THE ONE HUNDRED AND FOURTH ANNUAL COMMENCEMENT OF THE PHILADELPHIA COLLEGE OF PHARMACY AND SCIENCE

THE one hundred and fourth annual commencement of the Philadelphia College of Pharmacy and Science was held on Wednesday, June 9th, at 10 A. M. in the American Academy of Music, in the presence of an unusually large audience. Invocation was offered by the Rev. James R. Clinton. The principal speaker of the day was Dr. William D. Wadsworth, a medico-legal expert of international renown, and widely known for his scholarly attainments in the many fields of science. We are fortunate in being able to publish his able address in this issue of the JOURNAL.

Dean Charles H. LaWall, and J. W. Sturmer, Dean of Science, presented the candidates and the president of the College, Admiral William C. Braisted, conferred the degrees.

The following received the degree of Master of Pharmacy, *Honoris Causa;* Milton Campbell, of Philadelphia, a scientific pharmacist and head of a biological and pharmaceutical establishment of world-wide reputation; Josiah K. Lilly, of Indianapolis, whose activities have always been to the uplift of pharmacy, and in the service of mankind; Otto W. Osterlund, of Philadelphia, a prominent worker in pharmaceutical circles and member of the Board of Trustees of the College; Leonard A. Seltzer, a distinguished association worker and proprietor of a large professional pharmacy in the city of Detroit;

P. Henry Utech, of Meadville, Pennsylvania, member of the N. F. Revision Committee and an active and valued worker in the national associations.

Degrees in course were conferred upon special candidates, upon those who had completed the four-year course leading to Bachelor of Science, upon candidates who had qualified in graduate work for Pharmaceutical Chemist or for Bachelor in Pharmacy, and upon a large group who had completed the course leading to Graduate in Pharmacy. The list is as follows:

Doctor of Pharmacy (Phar. D.) in Course

Kamenosuke Shinohara, B. Sc.

Master in Pharmacy (Ph. M.) in Course

Clyde William Geiter, B. Sc.
Edwin N. Meuser, Phar. B.

Bachelor of Science in Pharmacy (B. Sc.)

Jeanette G. Baillargeon, Phar. B.
Thomas D. Ballinger
Flory D. Bridy
John H. Crittenden
Joseph F. McDonnell, Jr.
Tomoichi Machida
Isadore Mellanof
Aaron T. Newhard
Albert K. North
Pauline E. Pipkin
John Chester Rambo
Hugo Rieve
Frank L. Roma
Elmer K. Shaffer,
Howard E. Smith, Jr.

Samuel M. Wanamaker

Bachelor of Science in Chemistry (B. Sc.)

Joseph Bloom
Harry Theophilus Haefelin
Harry J. Schaeffer
Ralph L. Wells

Pharmaceutical Chemist (Ph. C.)

Clement Lee Huyck
John Bacon Lewis
Allen Foster Murray
Frank A. Pearl
Philip J. Sherman

Bachelor in Pharmacy (Phar. B.)

Elmer Bateman, Jr.
Joseph J. Dalton
Frank Hartwell Hagadorn
Raymond J. Heindl
William Kurland
John R. Lindsey
Ellis C. White
Peter Sitkay Wong

Graduate in Pharmacy (Ph. G.)

David Abramovitz
Morris G. Acton, Jr.
Alexander G. Albert
Jacob I. Allovitz
William R. Anthony
John J. Augustine
Alexander Auslander
Stuart B. Austin
John B. Balas
Maurice L. Banker
Charles H. Barnes
Blake H. Battin

Albert D. Bazrod
Abraham A. Benders
George T. Bennett
Emanuel Berkowitz
Louis Bernstein
Max Bernstein
John J. Betskoff
Harry N. Blanc
Arthur T. Bird
Noah Bobrow
Juliette K. Boileau
Gertrude Boroschoff
Harry W. Bosler
James Daniel Bower
James Davis Bower
Lester M. Brechbill
Aaron Brenner
William S. Brinsfield
Frank G. Brockman
Russell F. Brodman
Russell W. Brown
Ruth Eleanor Brown
Walter J. Callahan
Robert F. Cardamone
Michael L. Carey
Gunnard S. Carlson
Ed. Pryce Challenger, 2d
Anna G. Cherneck
Patrick C. Cleary
Bruce M. Coffee
Robert R. Coller
Maurice Comer
Mary Frances Cool
Harvey H. Cooper
Leighton McCauley Cope
Clair Bernard Cupp
Calona Dail Currier
Victor G. Degutis
James E. Delahanty
Anthony DeMarco
Abraham E. Deutsch
Conda H. Diehl
Richard H. Dietrich
Florentine F. Donato
Samuel Dreidink
Leopold Dyen
Richard H. Edling
Sheldon T. Evans
Donald R. Everitt
Albert Farber
Maxwell M. Farber
Francis J. Farmer
Henry N. Feiner
Eli T. Feldman
Jacob Fishkin
Frank B. Fleming, Jr.
Walter W. Follweiler
Abram D. Frey
Leon Freyman
Russell Friedbaum
Hyman Friedman
Anthony E. Fruncillo
Harry Galwardi
Ethel C. Geayer
Herman Gilderman
Samuel J. Glick
James E. Gluth
Louis Goldberg
Samuel Goldblum
Harry Goldstein
Samuel Goldstein
Louis W. Graffouliere
John Green
Martin I. Green
Frank Louis Greenberg
Alfred B. Griggs
J. Hampton Haldeman
Stanley D. Hammel
Milton Halinsky
Maxel L. Haney
Harrison Harbourt
Fenton E. Haskins
George F. Hauptman
Herman W. Haussmann
Ralph Heinold
Earl R. Hemperly
William R. Hindman
Paul A. Hofman
James Joseph Horan
Herman N. Horwald
Charles L. Hubbard
Robert A. Hummel
George R. Isenberg
William B. Jenkins
Roy E. Johnson
William L. Johnston
Abraham Josel
Joseph J. Kaback
Michael Kaczmarczyk
George Kanes
Maurice C. Kaplan
Isabella B. Kasper
Mark L. Kazunas
Harry Keen
Theodore Keesal
Lewis A. Keller
Jacob A. Klein
John A. Klenk
Johannes L. H. Koetz
Jos. J. Kolback, Jr.
Edward I. Kreamer
Joseph J. Kremper
Frank E. Lafferty
Thomas F. Langan
John Raymond Leaman
James Leibig
Max Lerner
Ben Levin
Simon Levine
Morris Levinson
Sara Levison
Wm. Meyer Levit
Maurice D. Litvin
Morris Lobel
Warren H. J. Luebert
Henry H. Machida
Frank J. Maier, Jr.
Ruth Mallowitz
Aaron H. Margolis
John H. Manley
Wm. H. Marshman
David J. Maxin
Steven A. Mazar
Bernard M. McCabe
Charles McCausland
Lindsay D. McClure
Elizabeth McCormick
John J. McLaughlin
Patrick D. McNelis
Lester L. Merkel
Mary A. Middaugh
Irving W. Middleton
Alex. G. Miller
Clark D. Miller

Lulu M. Miller
Ralph G. Miller
Edward S. Milner
Samuel B. Moffitt
Charles C. Morgan
Leon W. Morrissey
Benjamin J. Murdza
Edwin L. Murphy
John M. Murphy
Edmund E. Nardone
Robert E. Noone
Edward J. Notari
Jos. E. O'Loughlin
Benjamin B. Ominsky
Charles Pace
William Palau
James H. Panton
Charles H. Paul
Philip E. Pepper
Walter Perog
Jennings B. Pilchard
Blanche H. Pomeroy
William A. Pratt
Albert Price
John J. Pronko
George W. Prosser
Joseph Purpuri
Harold V. Pursel
Mary Samuela Raiser
John E. Randels
Joseph M. Reyes
Earl T. Robertson
Saul Rosenblum
Ida B. Rosner
Israel Rubin
Martin J. Sandberg
David Sanders
Howard C. Sayre
Joseph B. Scariato
Blane M. Schindler
Carl W. Schoenau
Vincenta W. Schultz
George S. Sehl
Joseph Seiden
Walter Sharshon
James J. Sheehan
Henry N. Sherrick
Norman J. Shiley
Charles Shore
Harry D. Silver
Herbert L. Simon
Stephen W. Simpson
Genevieve D. Slaughter
Andrew J. Smith
Isadore Socks
Jacob W. Soffer
Leon Stein
Virgil G. Stewart
Dorothy M. Straub
Abraham J. Sunshine
Herman C. Switkay
Eleanor F. Szczurowska
Sydney Taiz
Lewis Tamarkin
Paul C. Tigue
William F. Tollenger
Louise T. Torelli
Philip F. Trivelli
Harlan I. Underwood
James L. Van Dyke
Maurice W. Waite
Robert W. Walker
John F. Washeleski
Solomon S. Waxman
Israel Weintraub
Harry Weissman
Dorothy R. Whalen
Anthony E. Wickham
Paul E. Wieand
Harry Jones Wiest
Elwood S. Wilkins, Jr.
Clair A. Williams
Julian F. Wilson
Harold C. Wright
Paul L. Wurst
Saul Yablonovitz
Herbert F. Yingling
Ralph A. Young
Vernon T. Young
Lillian Zessman
Herman S. Ziskin

Certificates in Chemistry (Three-Year Course)

J. Lewis Deuble, Jr.
John A. Judge
Luke P. Reilly

STUDENTS WHO HAVE COMPLETED SPECIAL COURSES AND QUALIFIED FOR CERTIFICATES

(This does not include students who completed courses in these subjects for credits for a degree)

In Bacteriology

Susan Cawley
Raphael Glass
Edw. L. Gross
Nan McCrane
George D. Tobias
Frank Warren
Mabel M. Schlegel
Randall H. Stepp
Fannie P. Root
Maurice H. Rosoff
Daniel P. Maloy

In Clinical Chemistry

Blanche M. Becker	Fannie P. Root	George D. Tobias
Raphael Glass	Maurice H. Rosoff	Frank Warren
Daniel P. Maloy	Mabel M. Schlegel	

In Physiological Assaying

Jos. W. E. Harrisson, P. D., Ph. M. Manuel G. Jauregui

AWARD OF PRIZES, 1926

The **Howard B. French Cup** to the Ph. G. graduating class making a higher average than any preceding class, was awarded to the class of 1926 on the basis of a general average of 80.9.

The **Henry S. Wellcome Cup** to the B. Sc. graduating class attaining to advanced scholarship, was awarded to the B. Sc. class of 1926.

The **Martin Cup** to the Ph. G. graduating class making a higher general average than the class immediately preceding, was awarded to the class of 1926.

Graduate in Pharmacy (Ph. G.) Course

DISTINGUISHED

With General Average of Not Less Than 90 Per Cent.

Herman W. Haussmann Mark L. Kazunas Edwin L. Murphy

MERITORIOUS

With General Average Between 85 Per Cent. and 90 Per Cent.

Morris G. Acton, Jr.	Earl R. Hemperly	Edward J. Notari
William R. Anthony	William L. Johnston	Benjamin B. Ominsky
Max Bernstein	Ben Levin	Charles H. Paul
Aaron Brenner	Meyer Levit	Albert Price
Frank G. Brockman, Jr.	Warren H. J. Luebert	Joseph Seiden
Gunnard S. Carlson	Elizabeth McCormick	Leon Stein
Jacob Fishkin	Ruth Mallowitz	Sydney Taiz
Martin I. Green	John H. Manley	Elwood S. Wilkins, Jr.
Alfred B. Griggs	Chas. C. Morgan	Saul Yablonovitz

The **Procter Prize**, a gold medal and certificate for the highest general average of the class was awarded to:

HERMAN W. HAUSSMANN

The **William B. Webb Memorial Prize,** a gold medal and certificate for the highest general average in the branches of Operative Pharmacy, Analytical Chemistry and Pharmacognosy was awarded to:

EARL R. HEMPERLY

With Honorable Mention to:

Morris G. Acton, Jr.	Martin I. Green	Edwin L. Murphy
Frank G. Brockman, Jr.	Herman W. Haussmann	

The **Remington Memorial Prize,** $20.00 offered by the Estate of Joseph P. Remington, for the highest general average in the examinations in Operative Pharmacy and Dispensing, are awarded to:

JOHN A. KLENK

With Honorable Mention to:

Alfred B. Griggs	Henry H. Machida	Anthony E. Wickham
Mary A. Middaugh	Albert Price	Herman Ziskin

The **Frank Gibbs Ryan Prize,** a gold medal endowed by the Class of 1884, as a memorial to their distinguished classmate, for the best average in the Chemical and Pharmaceutical Laboratory Courses, was awarded to:

FRANK BROCKMAN, JR.

With Honorable Mention to:

Aaron Brenner	Herman W. Haussmann	Henry H. Machida
	Edwin L. Murphy	

The **Mahlon N. Kline Pharmacy Prize,** a Troemner Prescription Balance, offered by the Mahlon N. Kline Estate, for the highest average in Theory and Practice of Pharmacy, was awarded to:

EDWIN L. MURPHY

With Honorable Mention to:

Morris G. Acton, Jr.	Herman W. Haussmann	Albert Price
John J. Augustine	Earl R. Hemperly	Saul Rosenblum
Walter W. Follweiler	Warren H. J. Luebert	David Sanders
Martin I. Green	Edward S. Milner	

The **Bacteriology Prize,** $25.00, offered by the H. K. Mulford Company, to the candidate for graduation making the highest general average and the highest grade on a special examination, in Bacteriology and Serum Therapy, was awarded to:

HERMAN W. HAUSSMANN

With Honorable Mention to:

Martin I. Green Isadore Mellanof Pauline Pipkin
Leon Stein

The **Maisch Botany Prize,** $20.00 in gold, offered by Joseph Jacobs, Ph. M., D. Sc., of Atlanta, Ga., for the best herbarium collection of plants, was awarded to:

ELWOOD S. WILKINS, JR.

With Honorable Mention to:

William L. Johnston

The **Advanced Pharmacy Prize,** ten dollars' worth of books, offered by Professor Charles H. LaWall, for the highest grade in Advanced Pharmacy, to third and fourth year students, was awarded to:

JOHN B. LEWIS

With Honorable Mention to:

Edwin N. Meuser Joseph F. McDonnell Albert K. North
Howard E. Smith, Jr.

The **J. B. Moore Memorial Prize,** $25.00 in gold, offered by Rev. J. J. Joyce Moore and Mrs. H. H. Watkins, Jr., in memory of their father, J. B. Moore, to the candidate for graduation offering the best thesis representing work in the Department of Pharmacy, was awarded to:

MARK L. KAZUNAS

The **Kappa Psi Fraternity Prize,** a gold medal, awarded to a Kappa Psi student graduating with degree Ph. G., receiving the highest general average of any student of this fraternity, was awarded to:

CARL WILLIAM SCHOENAU

PRIZES AWARDED BY THE ALUMNI ASSOCIATION

The **Alumni Gold Medal,** for the highest general average in all branches in the Senior Year, was awarded to:

HERMAN W. HAUSSMANN

The **Alumni Prize Certificates,** for the highest general averages in individual branches in the Senior Year of the Ph. G. courses, were awarded as follows:

Pharmacy .....to Edwin L. Murphy
General Chemistry .....to Aaron Brenner

Materia Medica	to Herman W. Haussmann
Operative Pharmacy	to John A. Klenk
Analytical Chemistry	to Elizabeth McCormick
Pharmacognosy	to Herman W. Haussmann
Business Administration	to Mark L. Kazunas

PRIZE AWARDED TO UNDER-GRADUATE STUDENT

The **Alumni Bronze Medal,** for the highest general average in all branches in the Freshman Year of the Ph. G. course, was awarded to:

LEONARD C. RIESCH

COUNTRIES AND STATES REPRESENTED BY CANDIDATES FOR GRADUATION

Pennsylvania, Nebraska, Virginia, Texas, Wisconsin, New Jersey, Florida, New York, Tennessee, Maryland, Delaware, Mississippi, West Virginia, Canada, Japan, Hawaii, China, Spain, Nicaragua.

SCIENTIFIC AND TECHNICAL ABSTRACTS

DETERMINATION OF ACETONE AND ALDEHYDE. P. FLEURY and Y. AWAD reported to the French Society of Pharmacy (*Jour. Pharm. Chim.,* [8], 1926, *3,* 406) the results of an extended study of the method of determining acetone and acetaldehyde in association by means of Nessler's reagent. The procedure is as follows:

Treat the aqueous solution of the substances with an excess of Nessler reagent, stir, allow to stand 45 minutes and centrifuge. To the deposit add 2 c.c. of N/5 hydrochloric acid and dilute to a convenient volume. Collect the precipitate on a small filter, wash three times with 2 c.c. of water add to the filtrate 5 c.c. of a 20 per cent. solution of potassium iodide, 5 c.c. of N/10 iodine and 5 c.c. of 27 per cent. sodium hydroxide. Allow the mixture to stand for five minutes and then acidify with 15 c.c. of hydrochloric acid about N/5. Titrate the solution with N/50 thiosulphate. The precipitate on the filter is transferred to a capsule by a few c.c. of water and 20 c.c. of N/5 hydrochloric acid added and 10 c.c. of N/10 iodine. Dissolve and titrate with the thiosulphate solution the excess of iodine.

One c.c. of N/10 iodine is equivalent to 0.9666 gram acetone and 2 atoms of iodine correspond to 1 molecule of aldehyde, the reactions being respectively:

$$C_3H_6O + I_6 + {}_4NaOH = CHI_3 + Nac_2H_3O_2 + 3NaI + H_2O$$
$$C_2H_4O + I_2 + H_2O = HC_2H_3O_2 + 2HI$$

The acetone is precipitated by the Nessler reagent as a complex compound insoluble in water, containing about 62 per cent. of mercury and 27.14 per cent. of iodine. The aldehyde is converted into its corresponding acid.

H. L.

THE HOTTEST PLACE (ON EARTH).—A French writer has recently given in the *Annales de Geographie* an account of the Death Valley in Southwest California as the greatest depression in any part of the United States, having a mean depth of about 270 feet below sea level. This is indeed shallow as compared with the Dead Sea, the surface of which is nearly 1300 feet below the level of the Mediterranean. On the other hand Death Valley appears to show the highest temperature yet recorded in any spot on the surface of the earth. A meteorologic station established in 1911 has numerous records of temperatures much above 100° F., and on July 10, 1913, 145° F. was noted. The valley is bordered by ranges one of which has a maximum height of nearly 11,000 feet. It is worthy of note that the highest point in the United States is less than eighty miles away from the valley, Mt. Whitney, being 14,500 feet above sea level.

H. L.

DEATH-DEALING SOUND WAVES.—(*Science* News-Letter 1926, *8*, No. 265). A "death-noise" instead of a "death-ray," was the phenomenon discussed recently before the National Academy of Sciences by Prof. R. A. Wood and Alfred L. Loomis, of the Johns Hopkins University. The "death-noise" would have been inaudible to human ears, but it consisted of sound waves just the same, and it killed small fishes and other aquatic animals in vessels of water, in less than a minute.

The two researchers generated exceedingly high-frequency sound waves by means of electrical apparatus. The waves were produced at a rate of from 100,000 to 400,000 to the second; the upper limit of audibility to human ears is between 20,000 and 30,000. If a beam of these sound waves is directed toward the surface of the water, Prof.

Wood stated, the surface is heaped up in a mound. The vibrations heat the water, a rise of nearly 6° C. in one minute having been recorded.

DETECTION OF METHANOL.—F. R. Georgia and R. Morales ("Industrial and Engineering Chemistry," March, p. 304) have studied the action of interfering substances in testing for methyl alcohol in alcoholic preparations. The reagent used is a modification of Schiff's reagent (reduced fuchsin), containing rosaniline hydrochloride in place of fuchsin. It is prepared by dissolving 0.2 gram of rosaniline hydrochloride in 120 c.c. of hot water, and adding, after cooling, 2 grams of anhydrous sodium sulphite in 20 c.c. of water, followed by 2 c.c. of concentrated hydrochloric acid and dilution to 200 c.c. The test for methyl alcohol was Chapin's modification of Denigès' method, simplified as follows: 5 c.c. of alcohol solution (previously diluted to 5 per cent. by volume total alcohol) is oxidised for ten minutes with 2 c.c. of permanganate solution (containing 3 grams potassium permanganate and 15 c.c. of 85 per cent. phosphoric acid per 100 c.c.). Excess permanganate is then destroyed by addition of 2 c.c. of a solution containing 5 grams of oxalic acid dissolved in 100 c.c. of 1 to 1 sulphuric acid and water. As soon as the solution is decolorised, 5 c.c. of the reduced rosaniline reagant is added and the tube stood for ten minutes for development of the characteristic colour produced by formaldehyde. The following substances in 2 per cent. solution in 5 per cent. ethyl alcohol did not interfere with the test:

Substances Without Reaction Before or After Oxidation

Acetone	Formic acid	Oil of sweetbrier
Ammonium iodide	Fl. ext. quassia	Oil of wintergreen
Amyl alcohol	Furfural	*o*-nitrotoluene
Benzene	Glucose	Potassium idodide
Benzoic acid	Kerosene	Propyl alcohol
Brucine	Malic acid	Pyridine
Butyl alcohol	Menthol	Salicylic acid
Camphor	Nicotine	Shellac
Chloroform	Nitrobenzene	Sodium salicylate
Citric acid	Œnanthic ether	Spanish saffron
Dextrose	Oil of almond	Sucrose
Diethylphthalate	Oil of cassia	Tetrachlorethane
Erythrosine	Oil of cinnamon	Thymol
Ethyl acetate	Oil of cloves	Zinc chloride
Eucalyptol	Oil of spearmint	

Acetaldehyde formed during oxidation of the 5 per cent. ethyl alcohol solution does not cause any interference, though a 2 per cent. acetaldehyde solution gives a reddish-purple colour, which decreases noticeably by the end of ten minutes.

Substances Giving Positive Reaction After Oxidation

Acetaldehyde	Oil of bergamot	Oil of orange
Benzaldehyde	Oil of calamus	Oil of peppermint
Capsicin	Oil of citronella	Oil of pine
Cinchonine	Oil of coriander	Oil of rosemary
Fl. ext. arnica	Oil of curacoa	Oil of sage
Fl. ext. ipecac	Oil of fennel	Oil of sassafras
Formaldehyde	Oil of hyssop	Oil of sweetflag
Gingerin	Oil of juniper	Oil of thyme
Glycerol	Oil of lavender	Oil of wormwood
Licquorice	Oil of lemon	Safrol
Oil of angelica	Oil of mace	Strychnine sulphate
Oil of anise (Russn.)	Oil of marjoram	Turpentine
Oil of balm mint	Oil of mustard	
Oil of bay	Oil of nutmeg	

The following substances prevent the detection of methyl alcohol, unless they are removed, as they give precipitates with the aldehydes formed on oxidation: Aniline (green), methyl violet (blue), phenol (brown), resorcinol (orange), and tannic acid (yellow), the colour in parentheses being that of the precipitate. The authors recommend pyrogallol for removing formaldehyde, 1 gram in 10 c.c. being added to the test solution (diluted to 5 per cent. alcoholic strength), followed by 5 c.c. of concentrated sulphuric acid. The container or flask is stoppered, and the heat developed is sufficient to cause the reaction to proceed. After standing for ten minutes, 10 c.c. are distilled and 5 c.c. tested for methyl alcohol. Amyl alcohol, essential oils (except angelica) and fluid extracts of arnica and ipecac are subjected to treatment, which is a modified method of that of Thorpe and Holmes: To 10 c.c. of distillate (diluted to 5 per cent. alcoholic strength) 40 c.c. of water and 14 grams of sodium chloride are added and the mixture shaken out with 25 c.c. of petroleum ether in a separating funnel for five minutes. The separated salt solution, mixed with brine washings, is distilled and the first 10 c.c. tested. Cinchonine, glycerol, liquorice, methyl violet, quinine sulphate, resorcinol, strychnine sulphate and tannic acid are removed by distillation; aniline by distillation from sulphuric acid solution and phenol by dis-

tillation over sodium hydroxide solution. Acetaldehyde and benzaldehyde require addition of sulphuric acid before adding the rosaniline reagent. Methyl acetate, angelica oil, and pectinous substances are not removable.—*Through Chem. and Dr.*

Analyses of Fuels.—The stress resulting from the recent suspension in the anthracite district has compelled householders to seek substitutes. Except oil burners, dwellings and small apartment houses cannot install the machinery suitable to large plants. Coke and briquets were largely used. A cargo of briquets from Holland was received at Philadelphia and a specimen was obtained. Another briquet, not of the Holland type, was obtained, also two samples of coke and two of soft coal as supplied to dwellings. The analyses of these were made in the Technical Chemistry Laboratory of the Philadelphia College of Pharmacy and Science by Mr. J. L. Deuble, a pupil-assistant. The results in percentage were:

Sample	Volatile Matter	Ash
Holland Briquet	11.8	12.9
Domestic Briquet	9.0	10.2
Coke	....	10.2
Coke	....	24.7
Cannel Coal	17.0	22.0
Semi-Bituminous	33.5	12.0

Data of coal analysis must be received with caution on account of the difficulty of getting a representative sample. The only way seems to be to select as carefully as possible about a hundred pounds, reduce the lot to coarse powder, mix thoroughly, take out a small amount, reduce this to fine powder and analyze it. There is much irregularity in the ash of coal, which is the most important item for the housekeeper. A sample of red ash anthracite gave less than 4 per cent., and one of white ash over 40 per cent.

H. L.

Copper in Distilled Liquors.—Copper is a widely distributed element, occurring in many soils in amount much too small for profitable extraction but as many of its compounds are soluble in water it is liable to be taken up by plants; find its way into the food of grazing

animals and thus into human tissues. It is not uncommon to find notable traces of copper in the viscera of sheep and in human livers. Professor Kraemer showed many years ago that pure water kept for a few hours in a clean copper vessel will take up enough of the metal, possibly in a colloidal form, to act as a bactericide. It would be expected, therefore, that distillation of water, or still more, recently fermented liquids in copper vessels would result in contamination.

The question has been extensively investigated under the auspices of the Massachusetts State Board of Health by Hermann C. Lythgoe, P. O. Berry and S. H. Hall, whose results have been published in the *Boston Medical and Surgical Journal* (1926, *194*, 384). Distilled spirits are extensively manufactured and sold in Massachusetts. The Department of Public Health is required by law to make tests of intoxicating beverages, but prior to 1919 very little work was done in this line. Since then many samples have been submitted. During 1925, 9403 were examined of which 1690 were beer, 204 cider, 873 wine, 5632 distilled spirits, 14 flavoring extracts, 1006 alcohol and the remainder miscellaneous. It is worth noting in view of the agitation for the free sale of "beer and light wines" that 57 per cent. of the samples were "strong drink," less than 20 per cent. beer and less than 10 per cent. wine.

Not all the above mentioned samples were tested for copper but very many were and the following conclusions are drawn:

Alcoholic distillates from fermented liquor obtained by means of a copper condenser will be more or less contaminated with that metal.

Copper is present in about 10 per cent. of the distilled beverages sold or intended for sale in Massachusetts, occurring quantitatively in accordance with the laws of logarithmic probability series.

In the course of the investigation the question arose as to the copper content of pre-prohibition spirits. No general investigation along this line was made in that period, but the analysts were able to obtain a few samples of authentic nature. One sample, containing 50 per cent. of alcohol by volume, stamped as bottled in bond in 1914, showed the characteristic color and aroma of a whiskey aged in wood and contained 1 milligram of metal per 1000 c.c. Another authentic sample contained 4.3 mg. Acid liquors will, of course, show a greater amount of copper than neutral ones, hence distillates from wine and cider will be likely to show marked contamination.

H. L.

GRINDING COAL FOR ANALYSIS.—The sampling of coal has received much attention by fuel chemists, and properly so. It seems from the following report that the grinding of the final sample requires an equal exercise of care. Continuously high results upon coal samples in the laboratory of the John B. Stetson Company, Philadelphia, led to the close investigation of conditions with the findings that only the first siftings were being submitted to the laboratory by the department responsible for sampling. Accordingly the following tests were conducted:

The final sample was obtained by quartering and requartering a large lot to five pounds, reducing this to a No. 20 powder, then quartering again to about two ounces. This sample was run through a standard pulverizer and sifted through a No. 80 sieve. These siftings are represented by No. 1. The portion left on the sieve was again passed through the pulverizer, adjusted for *fine* grinding, and this fine powder so obtained is represented in report No. 2. The material left in the pulverizer afforded report No. 3.

	No. 1	No. 2	No. 3
Moisture	1.13%	.74%	.68%
Vol. and comb. matter	9.13%	9.14%	9.06%
Fixed carbon	76.5%	74.96%	63.74%
Ash	13.24%	15.16%	26.52%
Sulphur	.684%	.621%	.538%
B. T. U. (Emerson Calorimeter)	13.019	12.820	10.787

Note: (a) Moisture is lost during grinding, hence the need for rapid operation. (b) Ash percentage rises with the difficulty experienced in grinding. (c) None of these samples adequately represent the coal.

It will be seen from these figures that *all* of the final 2-ounce sample *must* be reduced to a fine powder (No. 80) and *all* of it submitted to the laboratory if a fairly true examination is desired.

While it is admitted that the textbooks generally comment upon this phase of coal analysis, a number consulted did not lay the necessary stress upon the matter.

P. P. R.

MEDICAL AND PHARMACEUTICAL NOTES

IODINE AN OLD REMEDY FOR GOITER.—Iodine as a preventive of goiter is no new thing under the sun, according to Dr. Gilbert D. Harris of Cornell University. In a recent issue of *Science,* he quoted from an old Spanish medical work by an early French scientist, Boussingault, who wrote in 1825. In one place the author states that, "till now, iodine is the only specific known for goiter." Elsewhere he continues, regarding certain mineral springs in Colombia, "In the province of Antioquia no other salt is used, save that from these peculiar springs, whose waters I have analyzed and convinced myself that, though the composition of their salts is variable, there is in all an appreciable amount of iodine. Hence the reason that there is no goiter in Antioquia: "each inhabitant takes every day a dose of iodine with the salt he consumes." Again: "It is a singular fact that for more than a century these waters have been recognized as a sure specific for goiter."—*Science Service.*

KAOLIN AND CHOLERA.—Kaolin, a constituent of porcelain and toilet powder, is a beneficial remedy for Asiatic cholera.

This feldspar clay, named for the Kao-Ling hills of China, has been used for centuries in that country not only in the manufacture of porcelain but by physicians, for fevers and intestinal disorders. Toward the end of nineteenth century, Julius Stumpf, of Wurzberg, employed it externally for septic wounds and ulcers and internally for cholera. But its modern medical and pharmaceutical applications with this exception appears to have been confined, according to editorial comment in the *Journal of the American Medical Association,* to use as a filtering material, a base for poultices, and dusting powder for wounds.

Recent research puts these early uses, however, on sound scientific basis. It has been found that though it is not an antiseptic agent, in fluid media if kept in motion it will carry down large numbers of bacteria. Thirty to sixty grams daily, it was ascertained, will change materially the reaction of the intestinal contents. Medical workers in this field are now using kaolin very successfully not only for Asiatic

cholera but bacillary dysentery and other acute intestinal disturbances as well. The use of prepared chalk in like manner, long preceded this scientific explanation of its mode of action.

BLOOD TRANSFUSION SIMPLIFIED.—Important experiments on blood transfusion, made by European scientists, appear to lead to the conclusion that special human blood donors will no longer be required in cases where transfusion is necessary to save a patient's life. The blood of a sheep or a cow might serve the same purpose, and special suspensions could be made in advance, and kept in bottles until required.

It has long been known that the most important point about blood in regard to transfusion is its specificity. That is to say, a rabbit can only be saved by the injection of the blood of another rabbit. If the blood of a different animal is injected into its tissues, it dies immediately. In the case of human beings, blood has been divided into four groups. When an injection has to be made, the blood of the patient has first to be tested to see which group he belongs to. Only rare individuals of the fourth group can give blood to any of the others with beneficial and not dangerous results.

THE GERM OF MEASLES ISOLATED.—Measles will become one of the preventable diseases in the very near future. The latest of medical achievements bids fair to bring this epidemic disease of childhood under partial control at least.

The discovery of a streptococcus that causes measles by Dr. N. S. Ferry and L. W. Fisher of Detroit was recently announced by the American Medical Association. This organism produces a soluble toxin that can be used in the production of antitoxin on a large scale. This antitoxin, which consists of horse serum treated with the measles toxin, can be used in both the preventive and curative treatment of measles.

The triumph of medical science over diphtheria and scarlet fever, both of which diseases are now capable of being controlled, was accomplished by similar steps and methods.

INSULIN IN CRYSTALLINE FORM; YET NOT PURE.—Insulin has been reduced to a purity so great that it comes down out of solution in the form of minute crystals, that shine like bits of uncut diamond

when viewed through the microscope. Yet this result has not satisfied Dr. John J. Abel and his corps of co-workers at the school of medicine of the Johns Hopkins University. They expect to spend the coming two or three years, at least, investigating the properties of those crystals.

The insulin used in medicine is effective clinically, but it has been recognized from the first that chemically it is far from being a pure product. Most chemical compounds indicate the attainment of a state of real purity by forming regular crystals, and nobody had been able to get crystals of insulin. The trouble was, Dr. Abel explained, that the insulin was all mixed up with a lot of other unknown substances that would precipitate at very nearly the same electro-chemical state of the solution.

Beginning with the ordinary insulin used in medicine, Dr. Abel and his associates passed it through an elaborate series of precipitations with various chemicals and repeated solutions in weak acetic acid. The crystals that come down at the last stage are very small. After settling out at the bottom of the flask they were picked up with a fine-pointed, rubber-tipped medicine dropper. The process of manufacture is so slow and difficult that months of work have resulted in the preparation of only a few hundred milligrams of the precious stuff.

This pure crystalline insulin is extremely potent, Dr. Abel states. One milligram of it, or a bit as large as a rather small grain of sand, has as much power to reduce blood sugar as is possessed by 100 clinical units of the solution used in medical practice. One-fiftieth of a milligram will throw a 4½ pound rabbit into convulsions, which are quickly cured, however, by injecting a little sugar solution into the rabbit's veins.—*Science Service.*

Tannic Acid in Burns.—E. C. Davidson (*Surg. Gynecol.* and *Obstet.*, 1925, August, 202) recommends the use of a dressing saturated with solution of tannic acid in the treatment of burns. Morphine sulphate, ¼ grain, is given hypodermically, and the burned area is covered with dry sterile gauze held in position by bandages. This dressing is then soaked in freshly prepared aqueous solution of tannic acid, 2.5 per cent. Inspection is made after 12, 18 and 24 hours by removing a small section of the dressing. As soon as the part has assumed a light brown colour all dressings are removed and the wound is left exposed to the air, carefully protected from injury.

For burns about the eyes a 5 per cent. ointment of tannic acid in soft paraffin and lanolin is useful, though less efficacious than the solution. Davidson thinks that the tannin precipitates the poisonous materials and prevents their absorption; it certainly provides a protective coating. It is most essential that the fluid balance of the body be maintained. The dressings can be removed painlessly by wetting the gauze with fresh tannin solution.—*The Prescriber,* through *Austral. J. P.*

NEWS ITEMS AND PERSONAL NOTES

PHILADELPHIA COLLEGE OF PHARMACY AND SCIENCE

The final convocation of the students of all classes and departments was held in the College auditorium on Wednesday morning, May 19th, at nine o'clock. The program was in charge of Prof. Adley B. Nichols. After the Alma Mater had been sung, Mr. Lee G. Cordier, Faculty Manager of athletics, was called upon to present the athletic awards to the College basket-ball and track men. Mr. Cordier in a short but enthusiastic address praised the members of the two teams for the splendid showing made during the year and he especially commended the members of the girls' basket-ball team, and then presented gold basket-balls to the following men: S. T. Evans, Capt., J. V. Granahan, P. C. Tigue, W. F. VanHorn, E. Nardone, I. H. Yingst, A. E. Wickham, Mgr., and A. L. Lochter. To W. S. Brinsfield, Capt. of the track team a gold track shoe emblem was awarded and the following members of the track team were awarded sweaters and College letters. E. Nardone, Mgr., J. F. Cobello, G. E. Miller, E. C. White, E. Wilkins, Jr., and J. J. Augustine. Each man was roundly applauded as he received his award and at the conclusion of the presentations several college cheers were given.

Mr. Harold Wright of the Senior Class in Pharmacy pleased the audience with three solos which he rendered splendidly. Mr. Harvey P. Frank of the Instructional Staff played the accompaniments.

Mr. Geo. T. Bennett, Senior Class President, then presented the College with a large electrical clock which was given by the Senior

Class in Pharmacy. The clock has been installed in the lower lobby and it operates the electric gong signals which are used to call and change classes. Dean J. W. Sturmer, of the School of Science, responded with a speech of acceptance on behalf of the College.

Pauline E. Pipkin, Genevieve D. Slaughter, Lillian Zessman, and Dorothy Whalen, on behalf of the co-eds and some of the alumnæ then presented the College with a gorgeous silk banner of blue and white, the College colors, and bearing the College seal. The banner is trimmed with a handsome gold fringe and rests upon a standard. It will add much beauty to the auditorium stage. Miss Pipkin made the presentation speech and Dean Charles H. LaWall responded for the College with an appropriate speech of acceptance. Dean LaWall in his remarks dwelt upon the College seal, adopted more than a century ago and told of what it has represented during all of these years since the days when colleges in America were few as compared with the present time.

Mr. C. A. Williams, Editor-in-Chief of "The Graduate," which is the Senior Annual, then presented a copy of the book to Prof. E. J. Hughes, to whom the book has been dedicated. Prof. Hughes responded and expressed his appreciation of the honor which had been conferred upon him after which he was tendered a mighty ovation. The assembly then concluded with the singing of the Alma Mater.

Dr. Robert J. Ruth, Field Secretary of the College, has just returned from a six months' trip which extended from coast to coast. He made the trip west over the northern route and returned by the southern route. Many hundreds of graduates were visited and a considerable survey of pharmaceutical conditions and problems was accomplished. Dr. Ruth made many addresses while on his trip, speaking at colleges of pharmacy, before pharmaceutical bodies and luncheon clubs.

Professor Ivor Griffith recently addressed the Graduating Class of the Kensington High School and later the Junior Classes at the same school and at the South Philadelphia High. He also gave his lecture on "One Drop of Blood" before the Y. W. C. A., of Kensington. This incidentally makes the fifteenth presentation of that lecture.

A number of interesting trips have been taken recently by certain groups of students of the Philadelphia College of Pharmacy and Science, as part of their educational work. Among these were a trip to the Academy of Natural Sciences by the three sections of the Ph. G. pharmacognosy class, a trip to the same institution and also a trip to the aquarium by the members of the B. Sc. class in biology. A trip to the botanical gardens at Glenolden by the classes in botany and biology, and a trip to Evenson's soap manufacturing establishment by the class in operative pharmacy.

The Board of Trustees at a recent meeting commissioned Norman C. Hulme, the architect to proceed with the drafting of final plans upon which competitive bids may be obtained, and it is hoped that ground may be broken for the new building on the West Philadelphia site this fall.

Professor E. Fullerton Cook and family have arrived in Europe where the Professor will study for fifteen or sixteen months with Professor Tschirch, at the University of Berne, Switzerland. The College granted Professor Cook leave of absence to conduct this advanced study, which will deal largely with International Pharmacopœial Standards. After a strenuous period of intensive work with the Pharmacopœia, in the capacity of chairman of the Revision Committee, and with the new Remington's Practice of Pharmacy, Professor Cook's sojourn in Europe, though pressed with action, happily comes as a much needed change. The JOURNAL sends him and his family cordial greetings.

BOOK REVIEWS

MATERIA MEDICA AND THERAPEUTICS INCLUDING PHARMACY AND PHARMACOLOGY. By Reynold Webb Wilcox, M. D., L. L. D., D. C. L. Eleventh edition. P. Blakiston's Sons, Philadelphia, (798 pages.) $5.00.

There is probably no text-book on materia medica more widely known among pharmacists than that of Wilcox's. The present edition does not differ in any essential feature from that of its predecessors, the only important changes being those required to conform to the new Pharmacopœia.

The book is divided into two parts; the first describes the physical and chemical properties of the official drugs, the second their therapeutic uses. While this separation of information would seem to make some difficulty in studying each drug, this inconvenience has been reduced to a minimum by an elaborate system of cross-references. Only those drugs and preparations recognized by the United States Pharmacopœia are considered, no attention is given to the National Formulary, nor are any of the numerous popular but unofficial remedies considered.

If one is searching for faults the most important criticisms to be made are that the index is not as elaborate as could be desired and that some of the statements concerning the active principles do not accurately represent the most recent ideas. For example: Veratrine is still given as an important constituent of Veratrum Viride, although it is generally believed today that it is not present in large enough proportion to play any part in the action of that remedy; under digitalis no mention is made of either gitalin nor digitophyllin.

The book is a model of conciseness and we have little doubt will continue to enjoy the popularity which has been its lot in the past.

H. C. Wood.

Prakticum der Physiologischen Chemie. By Peter Rona. First part, Fermentation procedures. Small 8vo. xi-331 pages, 73 illustrations, paper bound.

Within the memory of many scientists still in active work is the time when the nature of the ordinary fermentative processes was practically unknown. The fact that certain organisms, especially the yeasts, were always associated with the changes was well known, but whether these were merely coincident or causative was uncertain. A theory of "example" had for a long while some vogue. It was substantially that a decomposing substance would communicate its actions to adjacent molecules of a different nature. Today the whole field of putrefaction, fermentation and decay, the so-called "natural (or spontaneous) changes" of the older chemists, is fairly well understood. No phase of these changes has greater importance than those concerning the decompositions of the carbohydrates. Among all forms, of course those that produce alcohol are the most important. Whether the wave of restriction of the manufacture of alcoholic beverages, which has found emphatic expression in the United States,

but is not without manifestation in some European countries, will ultimately cause great changes in the industries concerned cannot be predicted, but the many important uses of alcohol outside of its beverage function would seem to prove that it will continue to be made on a large scale. Of course synthetic methods may cause the old-fashioned ones to be discarded.

The book in hand is a purely practical treatise. Discussions of theoretical questions and the nature of ferments are not included. It is, as noted above, a first part of a work which will appear in three parts and cover the whole subject of physiologic chemistry. It is very comprehensive and furnishes a vast amount of up-to-date information including methods of determination, separation of catalyses, description of apparatus, and many other data of use and interest to biologic chemists. The text is clear in construction and the book is neatly printed in excellent type and of a convenient size. When the work is completed it will constitute a valuable addition to the library of the biologic chemist.

H. L.

Sins of Science. By Scudder Klyce. Octavo, 432 pp. Cloth, $3. Marshall Jones Co., 212 Summer Street, Boston.

The author is a graduate of the Naval Academy in 1902, did post-graduate work in engineering and was retired from active service in 1912 for physical defect acquired in line of duty. For some years he held various executive and managing positions and served in both the Spanish and Philippine campaigns.

His first literary achievement was a volume entitled "Universe," published three years ago. This is a somewhat technical book on fundamentals and contains approving introductions by David Starr Jordan and John Dewey, two of our leading scientists and educators.

The volume before us, "Sins of Science," is much clearer and more entertaining than the former one. It shows the basic facts of life from all the usual aspects, especially those of success and happiness. The book is divided into three parts.

Part I. Knowledge from the Aspects of its Verbal Expression or Fundamentals in General, containing seventeen chapters.

Part II. Knowledge from the Scientific Aspect or Fundamentals of Science, containing chapters 18 to 30. This part contains much of interest to pharmacists, may I say "scientific" pharmacists, as for in-

stance chapter 21, What Matter Is; chapter 22, How Gravity Works; chapter 24, Ordinary Phenomena, such as Heat, Light, Electricity.

Part III. Knowledge from the Religious Aspects or Fundamentals of Religion, containing chapters 31 to 35.

The purpose of the book is to show that theoretical or *pure* scientists is lacking in any sound fundamentals, and hence is misleading to both applied scientists and the public. It is a popular, vigorous discussion of the fundamentals of science and religion! However, the author is cheerful and good-humored and points out facts that justify optimism. The primary object of the book is to show how to get success and happiness. I might also mention that those readers who want more details and further proofs can find much in "Universe," by the same author, which can be obtained at $2.20 per copy from the author, Winchester, Mass.

OTTO RAUBENHEIMER, PH. M.

HANDBUCH DER PRAKTISCHEN UND WISSENSCHAFTLICHEN PHARMAZIE. Unter Mitarbeit erster Fachgenossen herausgegeben von Geh. Reg. Rat Prof. Dr. Hermann Thoms, Direktor des pharm. Instituts der Univ. in Berlin. 6 Lexicon Volumes. Urban & Schwarzenberg, Berlin und Wien.

The referee had the pleasure to review Vol. I and II of this master work in THE AMERICAN JOURNAL OF PHARMACY, October, 1924, pp. 791 and 792 and Vol. III in April, 1926, pp. 245 and 246.

Volume IV, just completed and before us, contains 1036 pages and 131 figures and four colored plates. It is divided into the following four parts:

A. Normal and Pathological Physiology. Among the ten monographs I want to point out the following: Vitamines by E. Buergi, Bern; Enzymes by H. Haehn, Berlin; Abderhalden's Reaction by E. Abderhalden, Halle a. S. and Lipoids by E. Schmitz, Breslau.

B. Hygiene. Among the nine monographs, the referee wants to call attention to the following: Hygiene of Public Life by A. Korff-Peterson, Berlin; Bacteriology by C. Stich, Leipzig; Disinfection and Disinfectants by H. Bechhold and H. Schlossberger, Frankfort a. M.; Infectious Diseases by F. Schiff, Berlin.

C. Selected Methods of Analysis. This exceedingly interesting and instructive part of Vol. IV contains twelve monographs, among

which the following are of special use to the scientific pharmacist: Chemical, Microscopical and Bacteriological Analysis of Urine, Sputum, Gastric Juice, Feces, etc., by the veteran pharmacist and authority on this subject, Apotheker E. Kraft, Bads Kissingen; Bile, its Colors and Acids by F. Boedeker, Berlin-Britz; Analysis of Exudates, Transudates and Cyst Contents by P. Wolff, Berlin; Hæmolysis by E. Sieburg, Hamburg; Wassermann Reaction by W. Thoms, Berlin; Agglutination and Precipitation by E. Gildemister, Berlin-Lichterfelde and the d'Herelle's Phenomenon by R. Otto, Berlin. This part of the book, consisting of *selected* Methods of Analysis, methods which are trustworthy, methods which have been worked out and are in practical use by authorities in the respective fields, is alone worth the price of the entire work!

D. Foundation and Aims of Therapy. Among the sixteen monographs in this part, the referee begs to call attention to the following most important ones: Pharmacotherapy by P. Wolff, Berlin; Pharmacology by E. Buergi, Bern; Chemotherapy by J. Morgenroth, Berlin-Dahlem; Anaphylaxis by E. Friedberger, Greifswald; Physical Therapy by A. Lagueur, Berlin; Relation between Chemical Constitution and Physiological Action by E. Rost, Berlin; Synthesis of Medicaments by K. W. Rosenmund, Berlin-Lankwitz; Homeopathy by J. Katz, Leipzig; Veterinary Medicines by O. Regenbogen, Berlin; Roentgenology by O. Strauss, Berlin; Toxicology by A. Heffter, Berlin, and First Aid by A. Kesser, Berlin.

At the end of each chapter there is a very complete bibliography not only of the literature of Germany but of the entire world including the United States, a great help to the reader be he student, pharmacist, chemist, physician or teacher.

The treatment is modern throughout and contains the most recent investigations. It is a great book, by great men on a great subject! In short, it is a master work! Let us hope that this Handbook of Practical and Scientific Pharmacy will soon be completed in six volumes and also that it will become well known in the United States.

OTTO RAUBENHEIMER, PH. M.

Acknowledgment:

Through editorial oversight "The Prescriber" was not given proper credit as being the source of the Selected Editorial, "International Uniformity," which appeared in our April number.